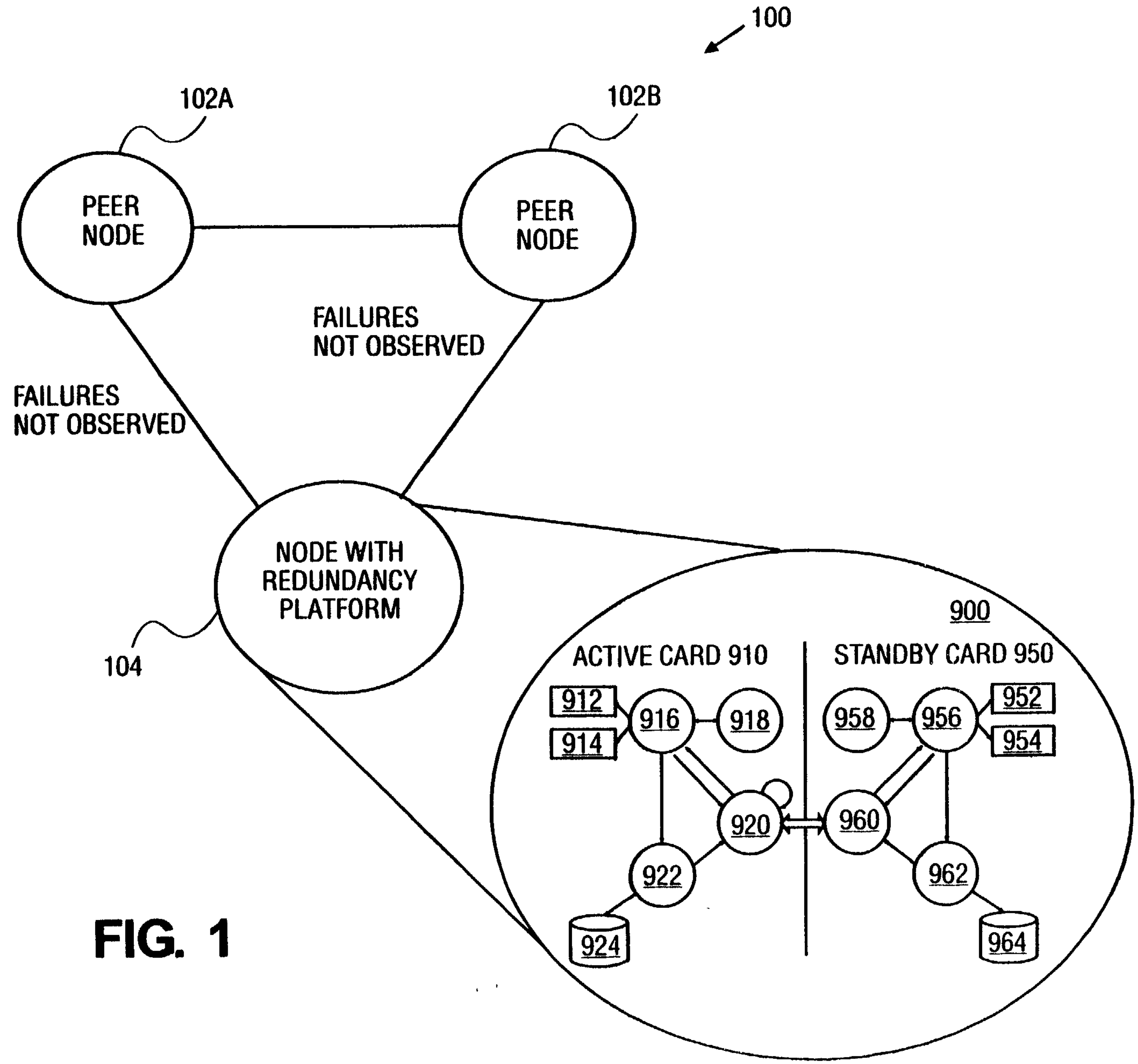
100
102A
102B
PEER
NODE
PEER
NODE
FAILURES
NOT OBSERVED
FAILURES
NOT OBSERVED
NODE WITH
REDUNDANCY
PLATFORM
104
900
ACTIVE CARD 910
STANDBY CARD 950
912
914
916
918
920
922
924
952
954
956
958
960
962
964

FIG. 1

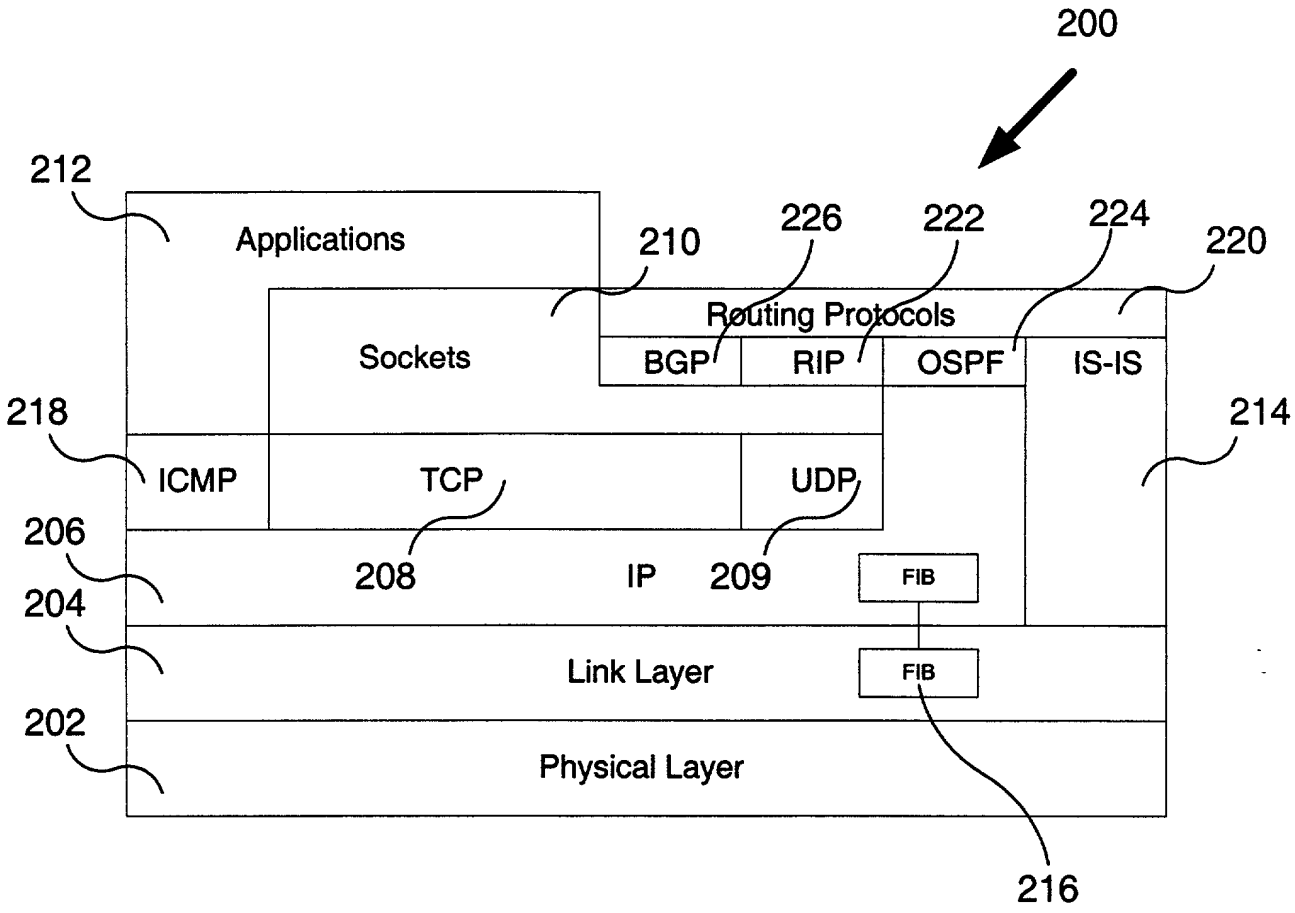
200
212
Applications
210
226
222
224
220
Routing Protocols
Sockets
BGP
RIP
OSPF
IS-IS
218
214
ICMP
TCP
UDP
206
208
IP
209
FIB
204
Link Layer
FIB
202
Physical Layer
216

FIG. 2

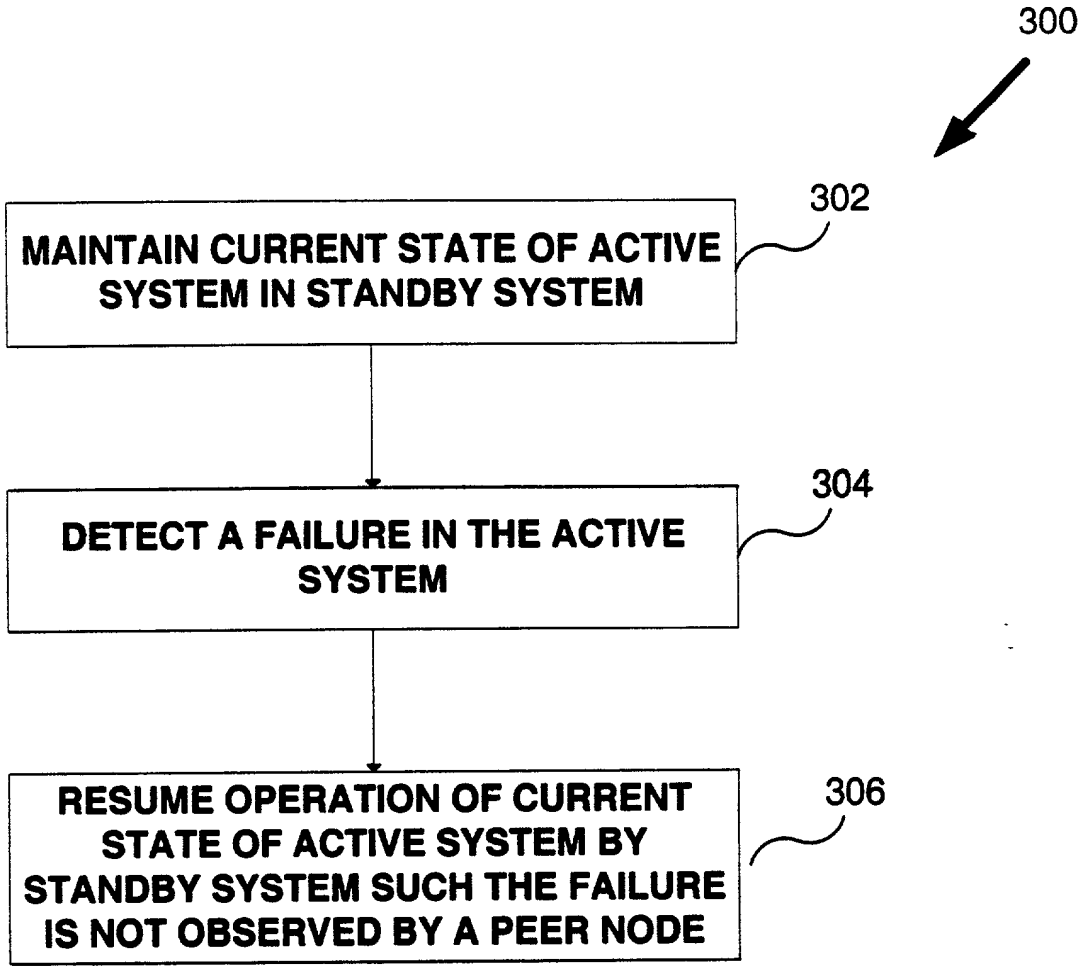
300
302
MAINTAIN CURRENT STATE OF ACTIVE SYSTEM IN STANDBY SYSTEM
304
DETECT A FAILURE IN THE ACTIVE SYSTEM
306
RESUME OPERATION OF CURRENT STATE OF ACTIVE SYSTEM BY STANDBY SYSTEM SUCH THE FAILURE IS NOT OBSERVED BY A PEER NODE

FIG. 3

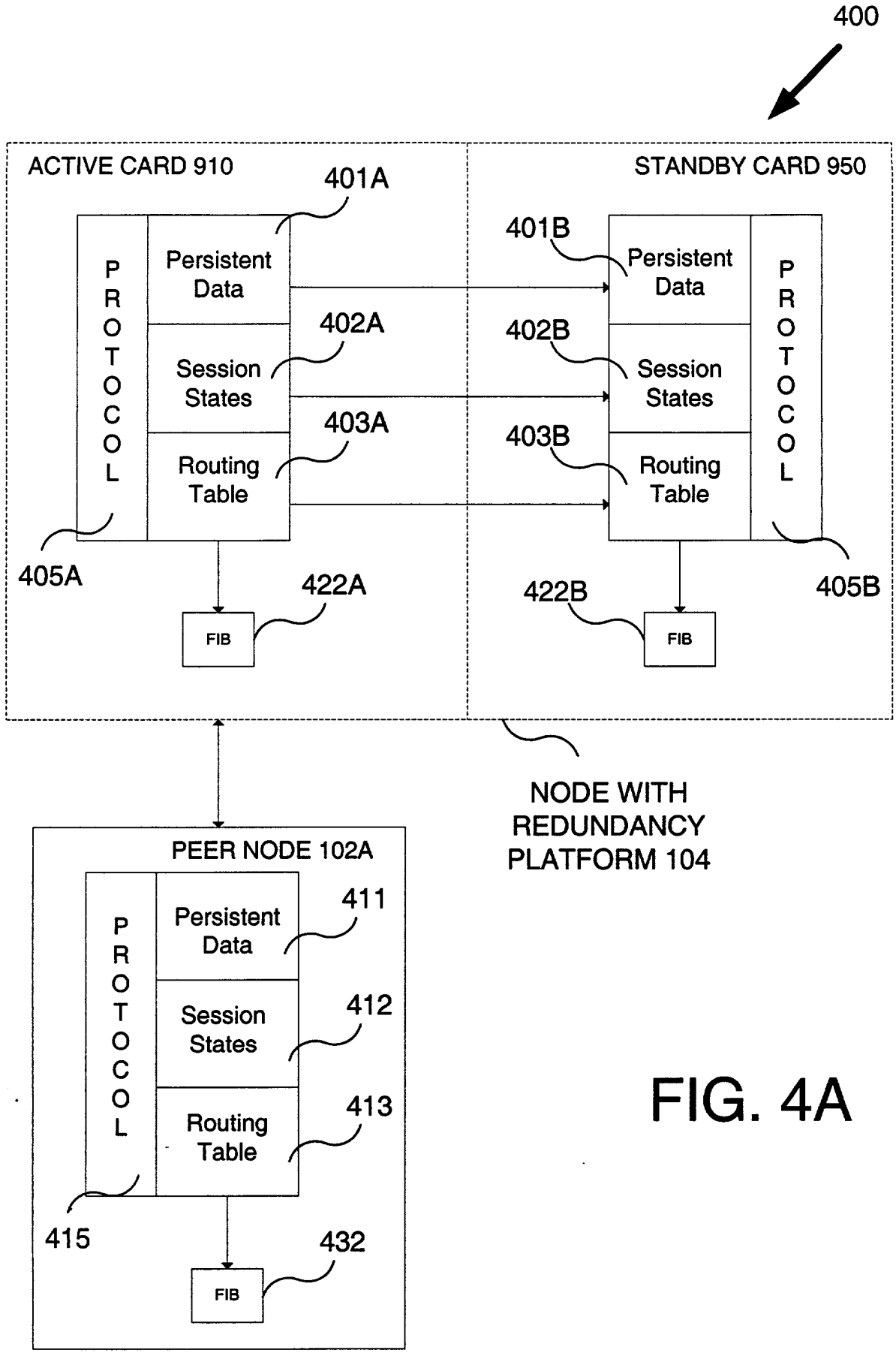
400
ACTIVE CARD 910
STANDBY CARD 950
401A
401B
Persistent Data
Persistent Data
PROTOCOL
PROTOCOL
402A
402B
Session States
Session States
403A
403B
Routing Table
Routing Table
405A
405B
422A
422B
FIB
FIB
NODE WITH REDUNDANCY PLATFORM 104
PEER NODE 102A
411
Persistent Data
PROTOCOL
412
Session States
413
Routing Table
415
432
FIB

FIG. 4A

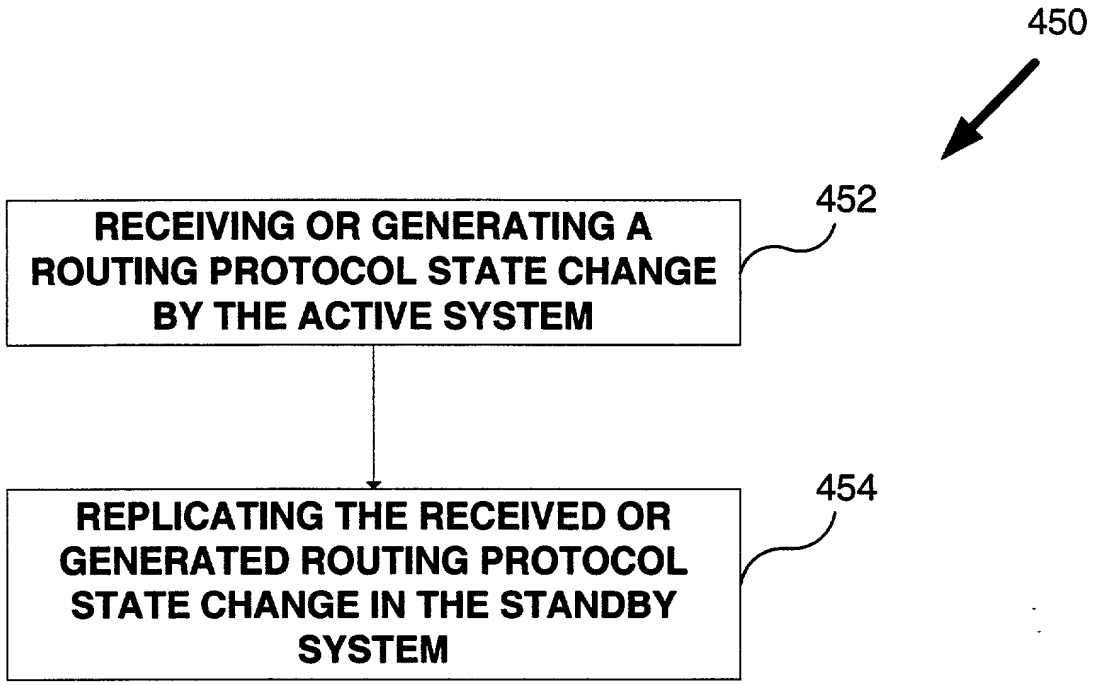
450
RECEIVING OR GENERATING A ROUTING PROTOCOL STATE CHANGE BY THE ACTIVE SYSTEM
452
REPLICATING THE RECEIVED OR GENERATED ROUTING PROTOCOL STATE CHANGE IN THE STANDBY SYSTEM
454

FIG. 4B

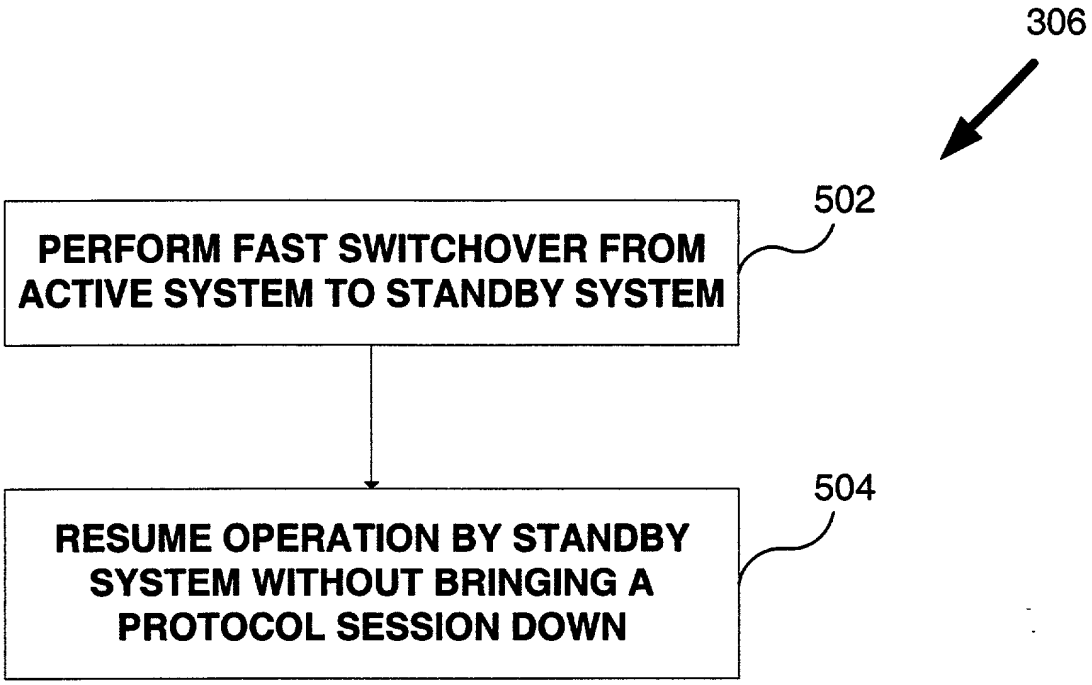
306
502
PERFORM FAST SWITCHOVER FROM ACTIVE SYSTEM TO STANDBY SYSTEM
504
RESUME OPERATION BY STANDBY SYSTEM WITHOUT BRINGING A PROTOCOL SESSION DOWN

FIG. 5

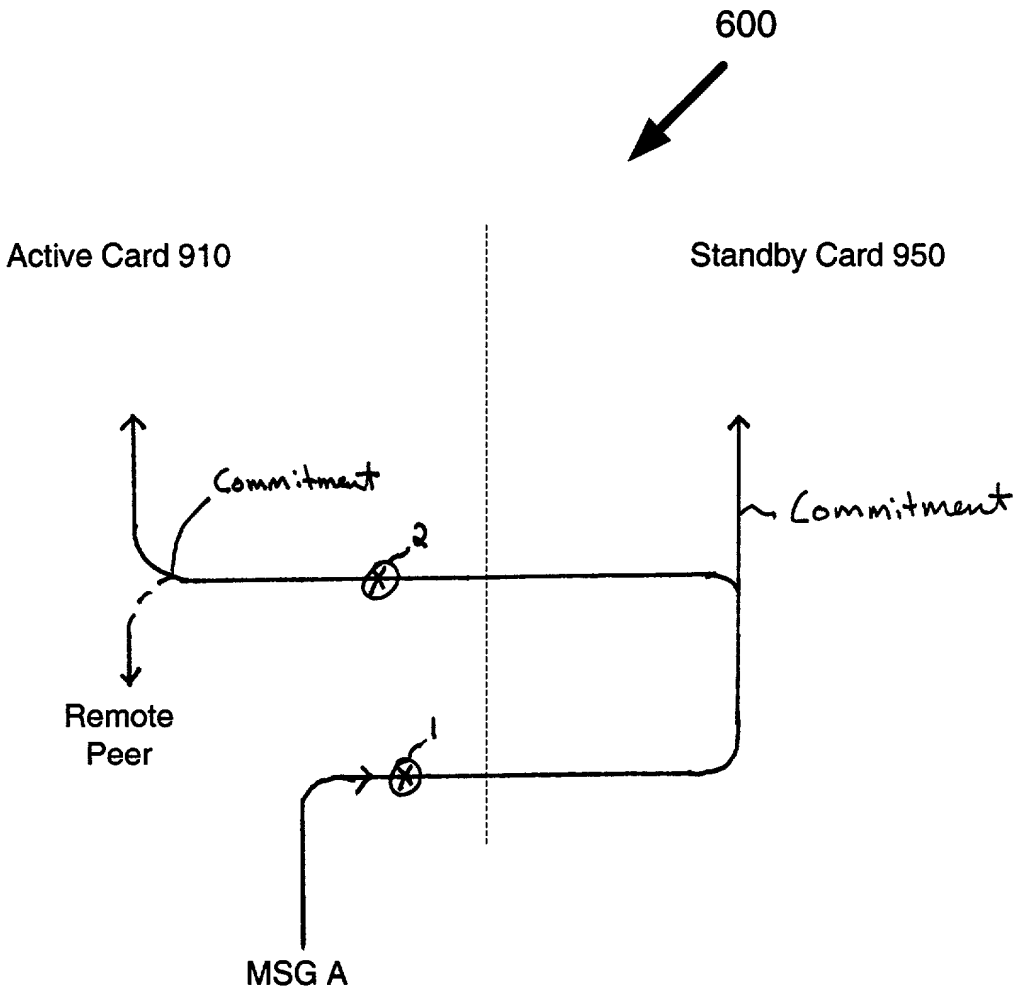
600
Active Card 910
Standby Card 950
Commitment
2
Commitment
Remote
Peer
1
MSG A

FIG. 6A

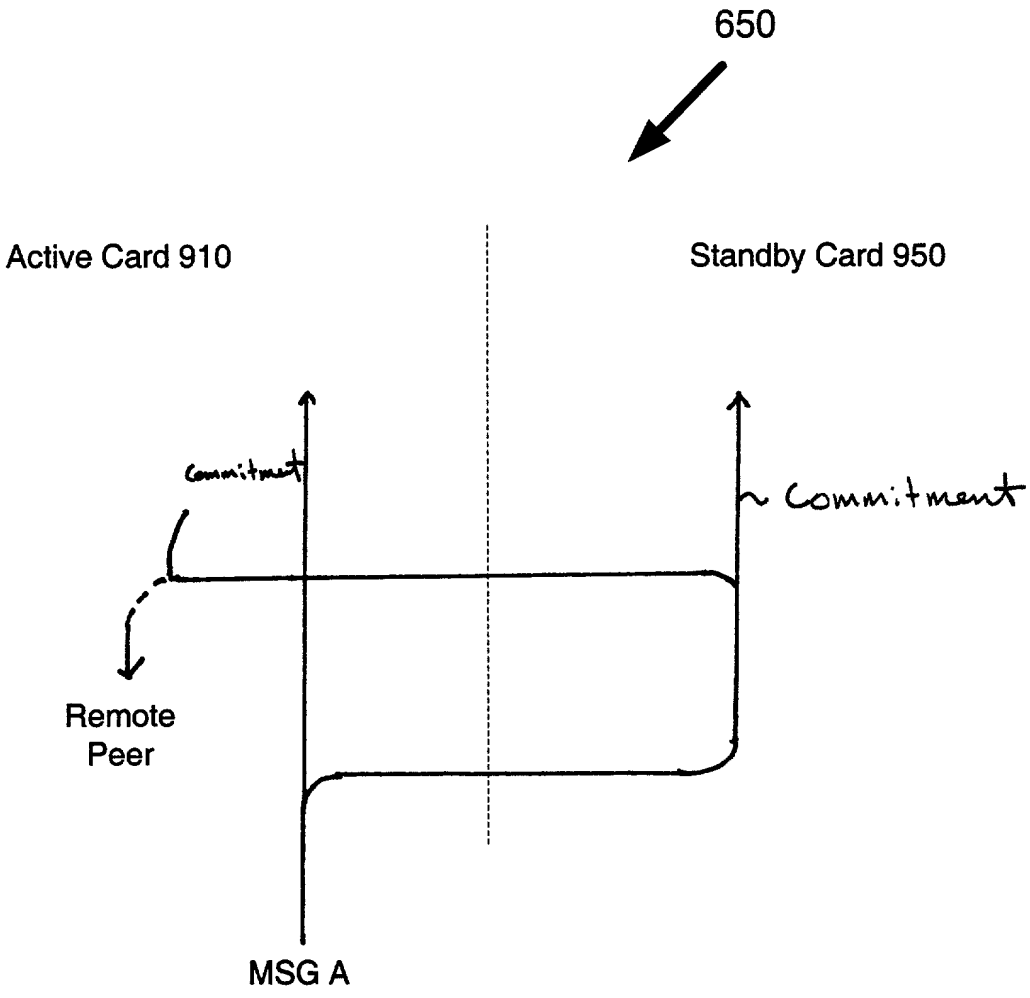
650
Active Card 910
Standby Card 950
Commitment
Commitment
Remote
Peer
MSG A

FIG. 6B

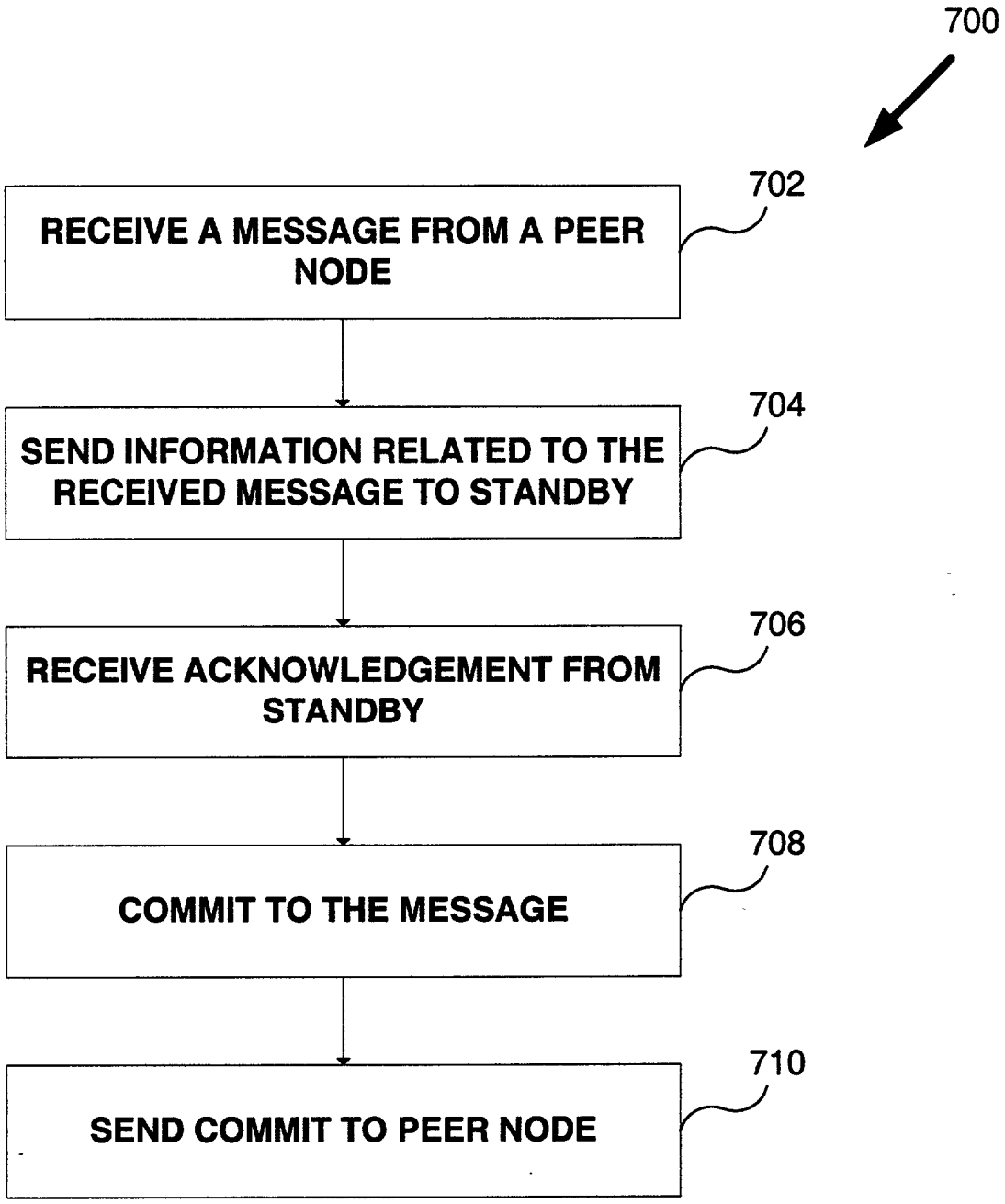
700
RECEIVE A MESSAGE FROM A PEER NODE
702
SEND INFORMATION RELATED TO THE RECEIVED MESSAGE TO STANDBY
704
RECEIVE ACKNOWLEDGEMENT FROM STANDBY
706
COMMIT TO THE MESSAGE
708
SEND COMMIT TO PEER NODE
710

FIG. 7

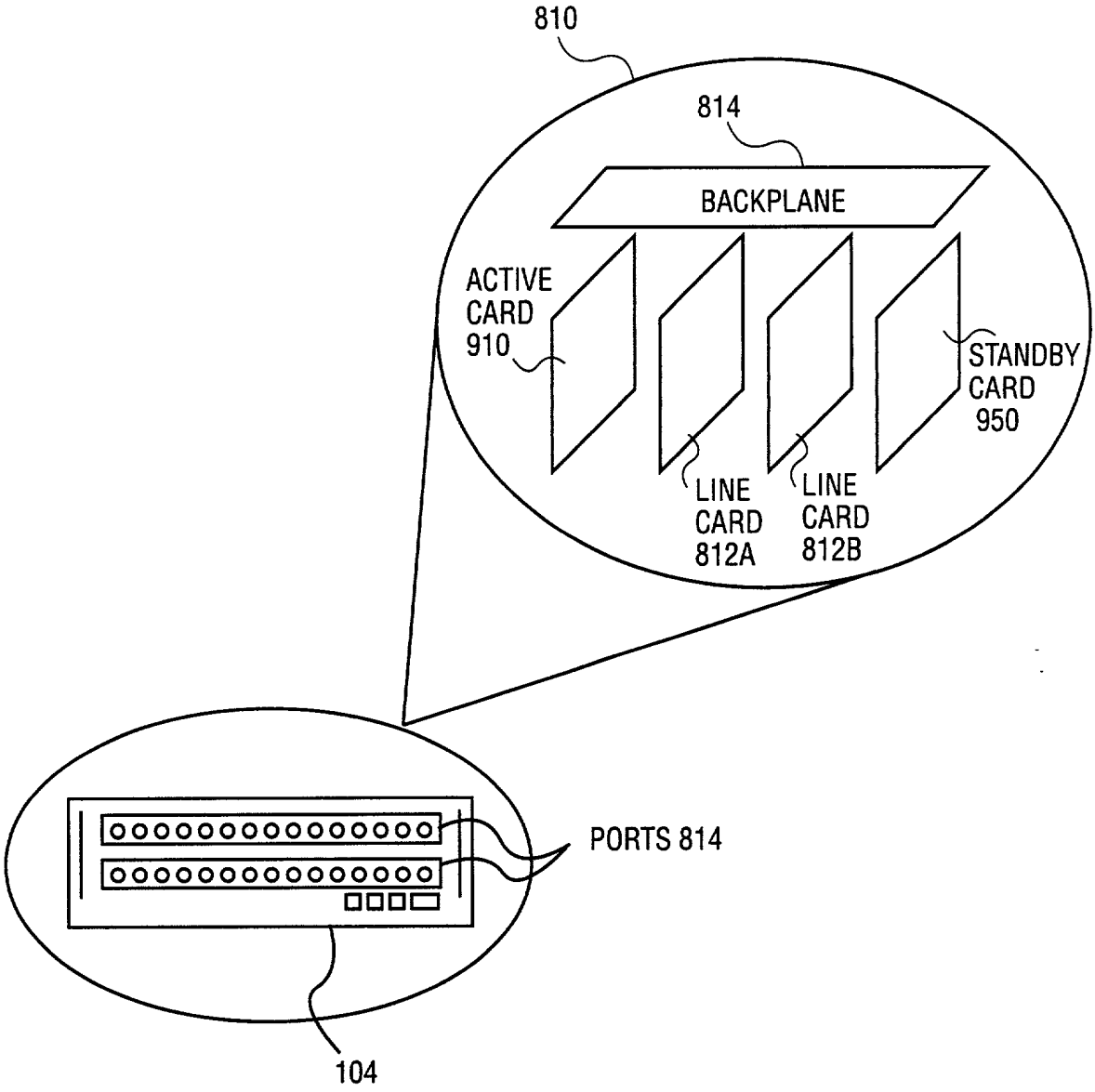
810
814
BACKPLANE
ACTIVE CARD 910
STANDBY CARD 950
LINE CARD 812A
LINE CARD 812B
PORTS 814
104

FIG. 8

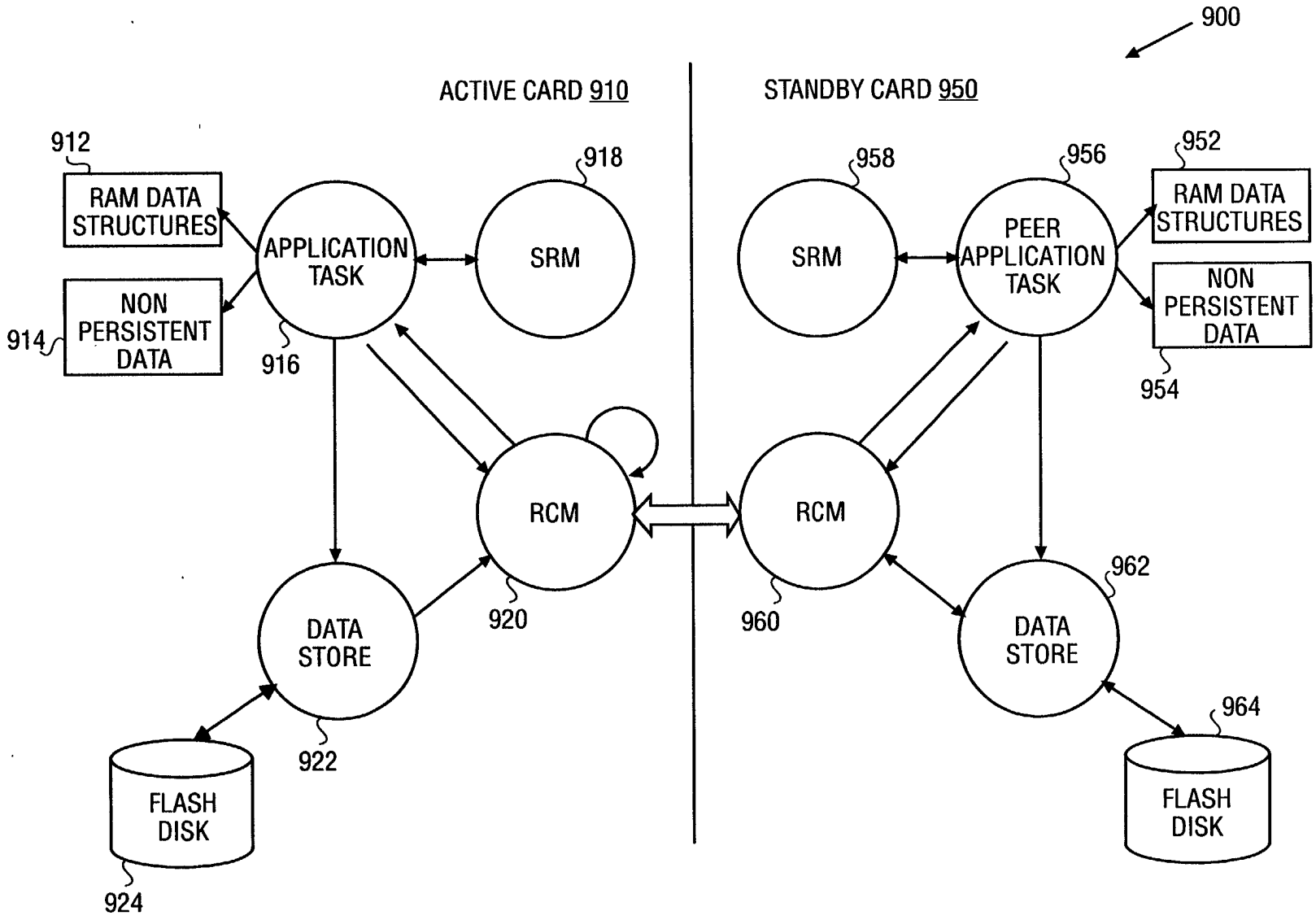

FIG. 9

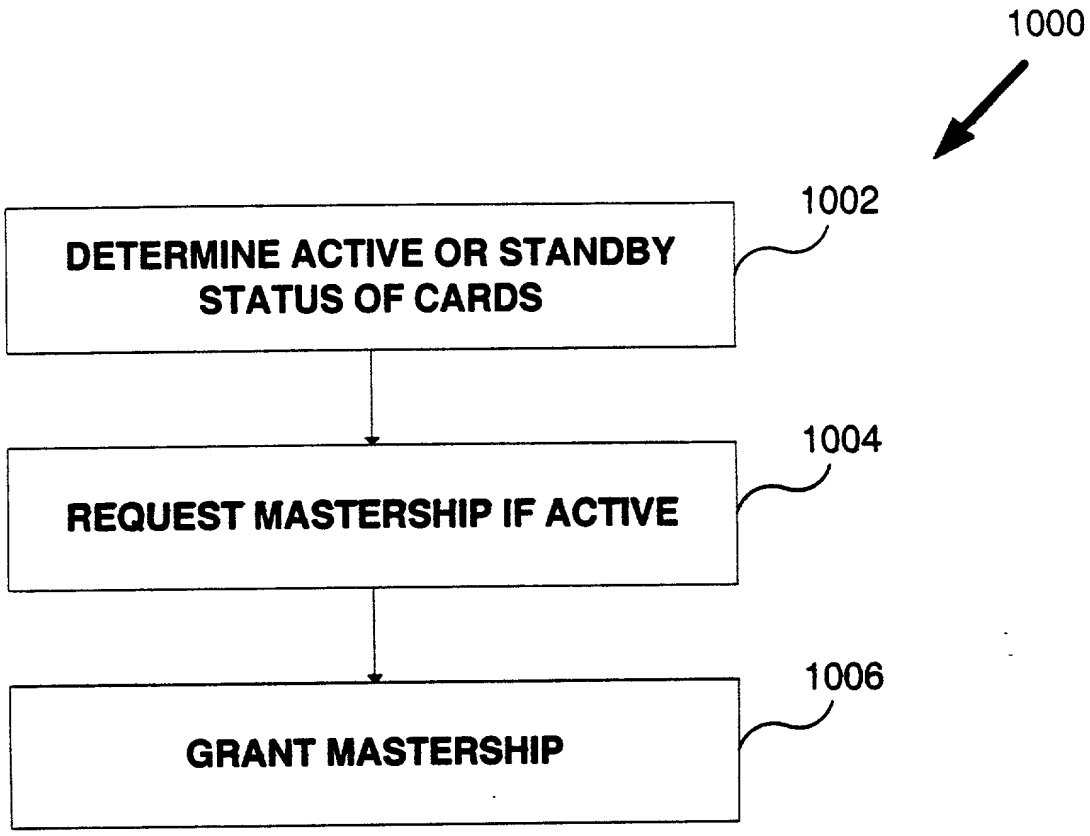
1000
1002
DETERMINE ACTIVE OR STANDBY STATUS OF CARDS
1004
REQUEST MASTERSHIP IF ACTIVE
1006
GRANT MASTERSHIP

FIG. 10A

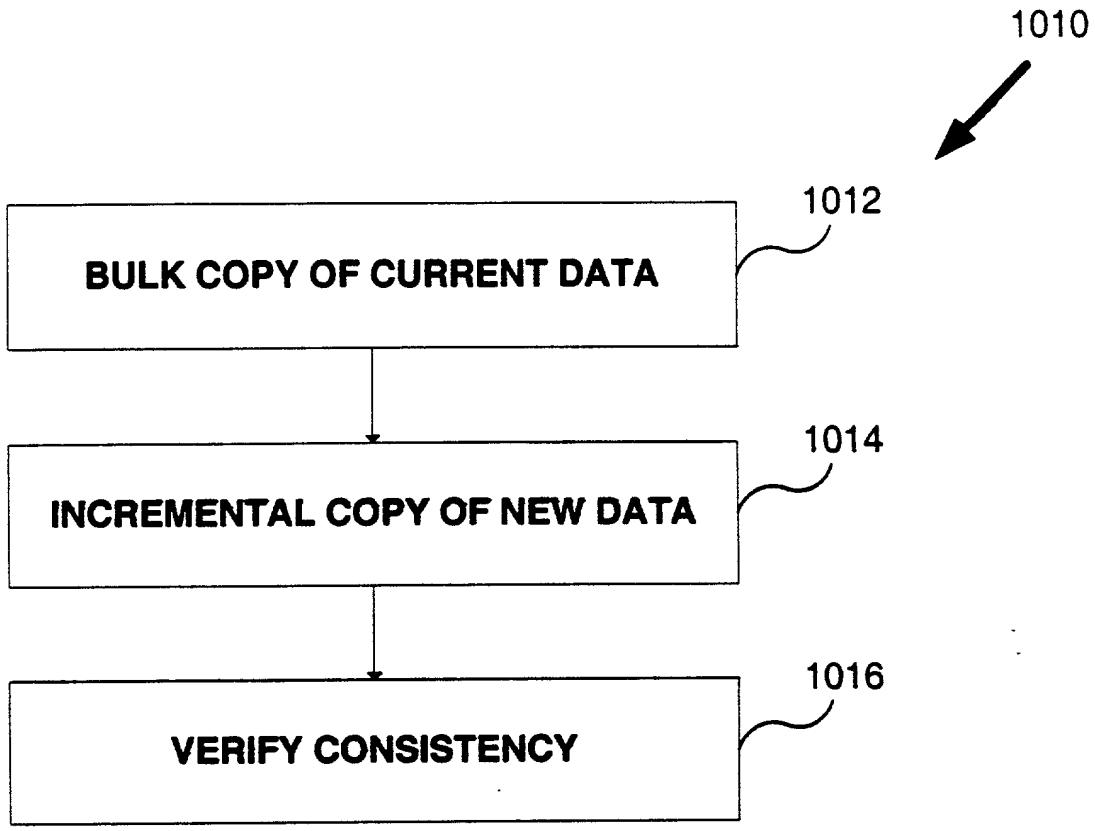
1010
1012
BULK COPY OF CURRENT DATA
1014
INCREMENTAL COPY OF NEW DATA
1016
VERIFY CONSISTENCY

FIG. 10B

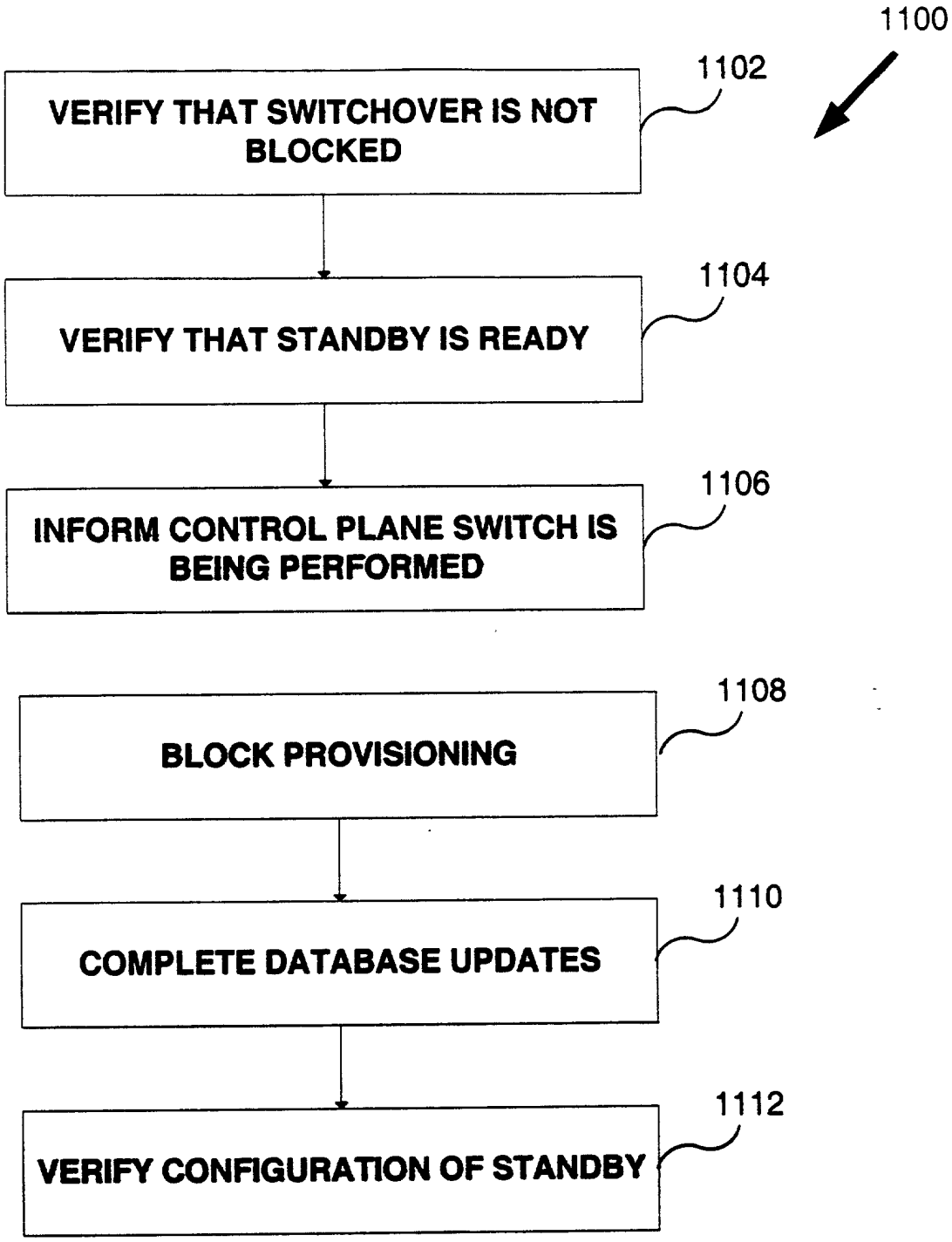
1100
1102
VERIFY THAT SWITCHOVER IS NOT BLOCKED
1104
VERIFY THAT STANDBY IS READY
1106
INFORM CONTROL PLANE SWITCH IS BEING PERFORMED
1108
BLOCK PROVISIONING
1110
COMPLETE DATABASE UPDATES
1112
VERIFY CONFIGURATION OF STANDBY

FIG. 11A

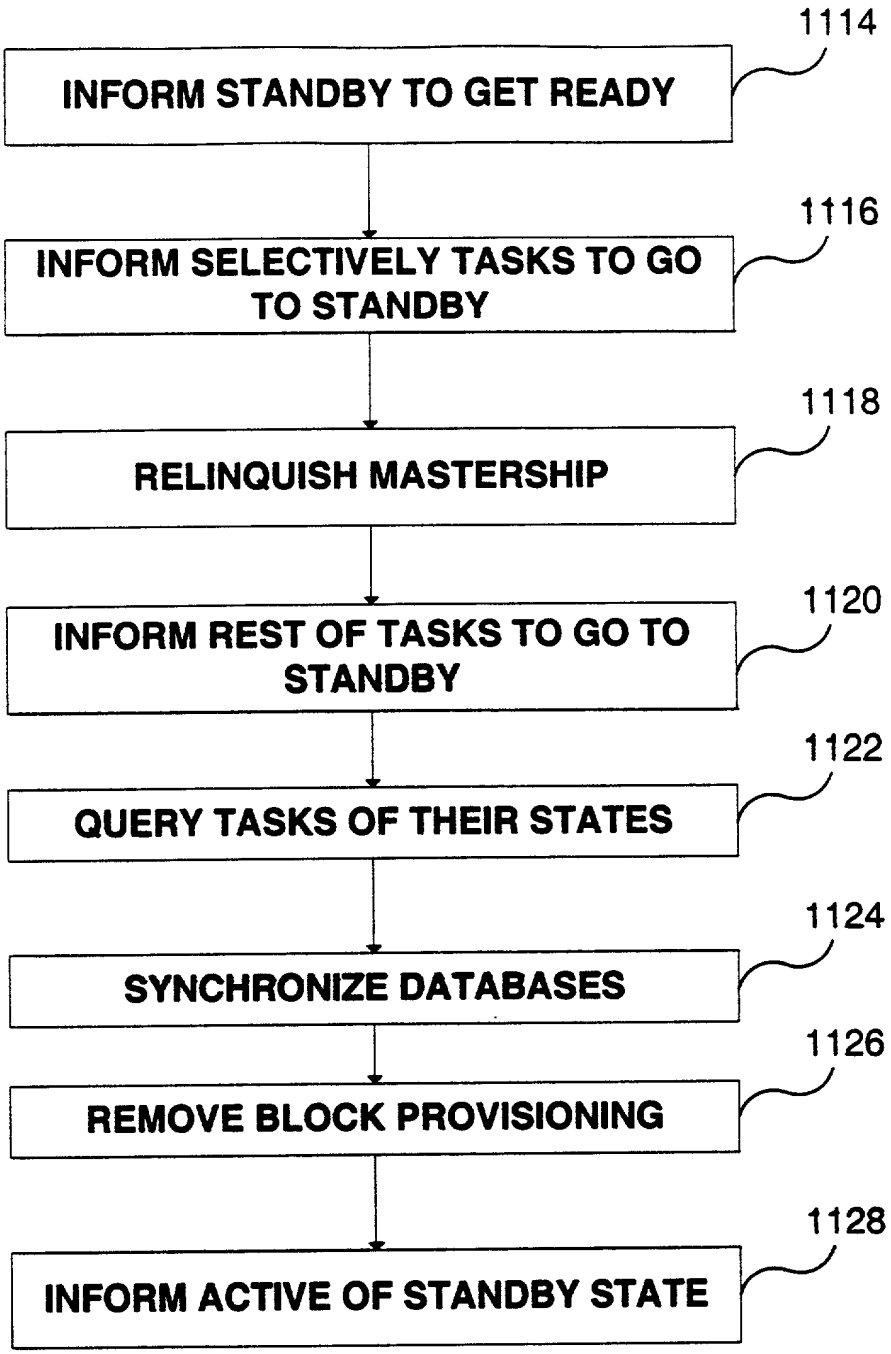
1114
INFORM STANDBY TO GET READY
1116
INFORM SELECTIVELY TASKS TO GO TO STANDBY
1118
RELINQUISH MASTERSHIP
1120
INFORM REST OF TASKS TO GO TO STANDBY
1122
QUERY TASKS OF THEIR STATES
1124
SYNCHRONIZE DATABASES
1126
REMOVE BLOCK PROVISIONING
1128
INFORM ACTIVE OF STANDBY STATE

FIG. 11B

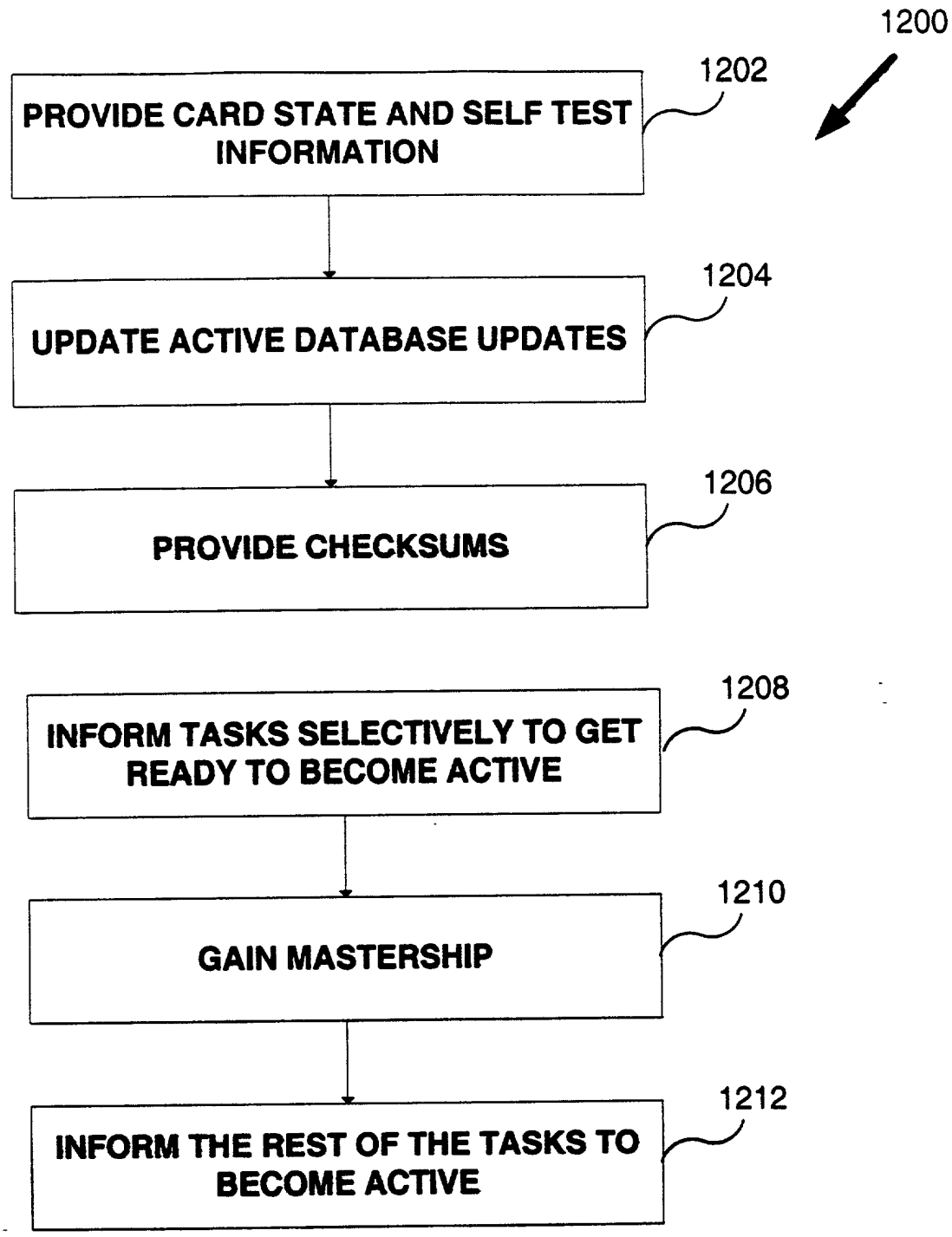
1200
1202
PROVIDE CARD STATE AND SELF TEST INFORMATION
1204
UPDATE ACTIVE DATABASE UPDATES
1206
PROVIDE CHECKSUMS
1208
INFORM TASKS SELECTIVELY TO GET READY TO BECOME ACTIVE
1210
GAIN MASTERSHIP
1212
INFORM THE REST OF THE TASKS TO BECOME ACTIVE

FIG. 12A

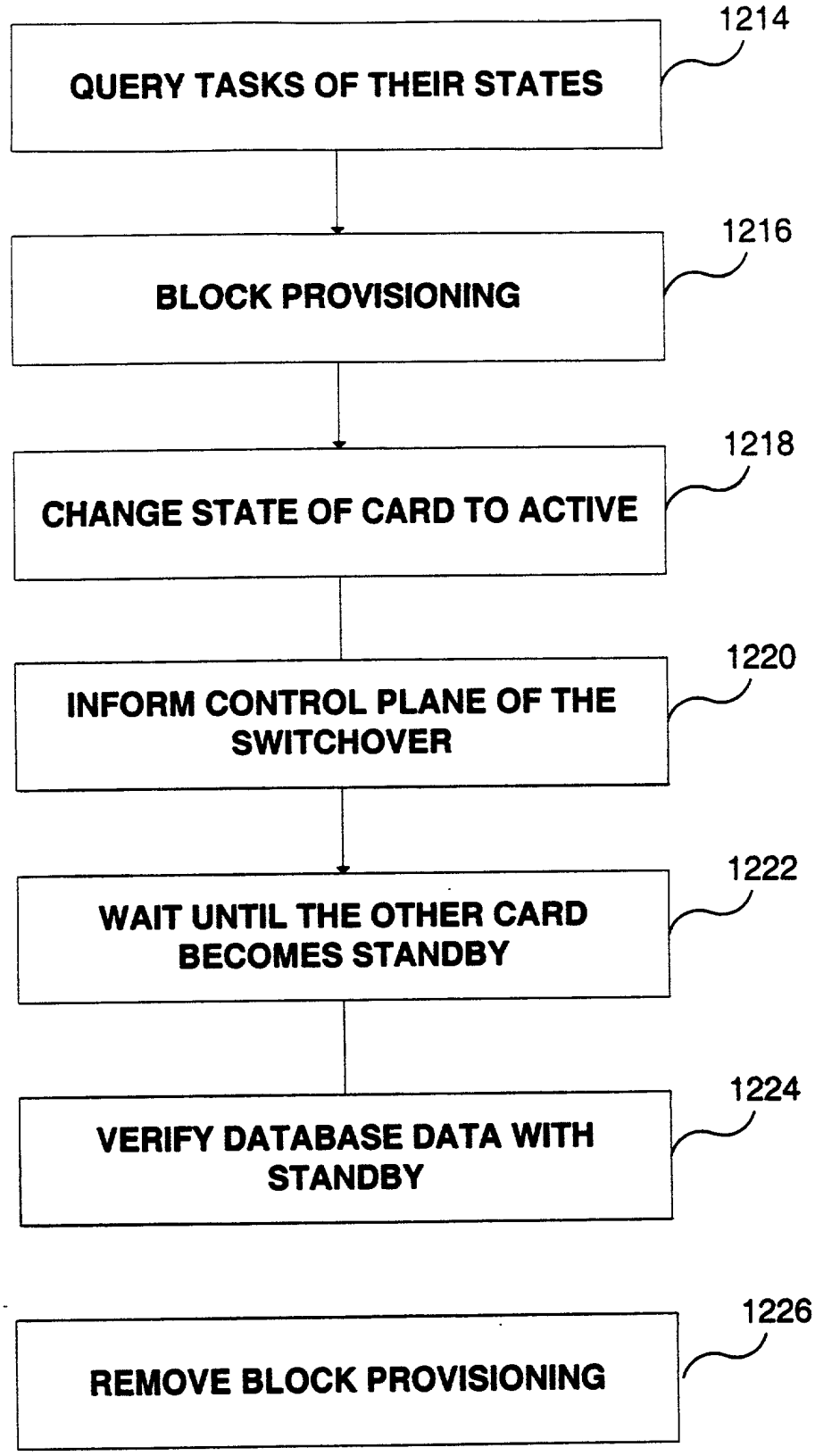
1214
QUERY TASKS OF THEIR STATES
1216
BLOCK PROVISIONING
1218
CHANGE STATE OF CARD TO ACTIVE
1220
INFORM CONTROL PLANE OF THE SWITCHOVER
1222
WAIT UNTIL THE OTHER CARD BECOMES STANDBY
1224
VERIFY DATABASE DATA WITH STANDBY
1226
REMOVE BLOCK PROVISIONING

FIG. 12B

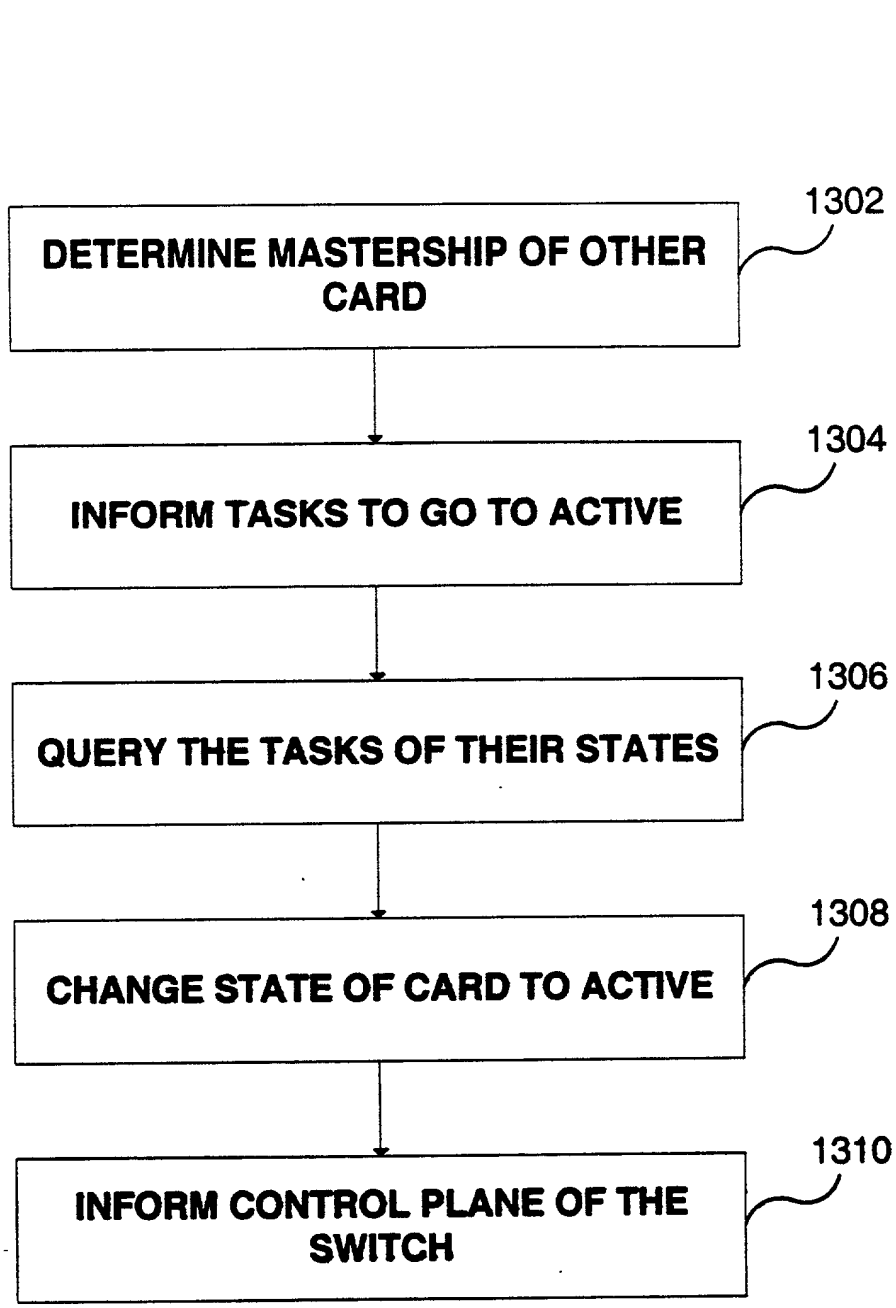
1300
1302
DETERMINE MASTERSHIP OF OTHER CARD
1304
INFORM TASKS TO GO TO ACTIVE
1306
QUERY THE TASKS OF THEIR STATES
1308
CHANGE STATE OF CARD TO ACTIVE
1310
INFORM CONTROL PLANE OF THE SWITCH

FIG. 13

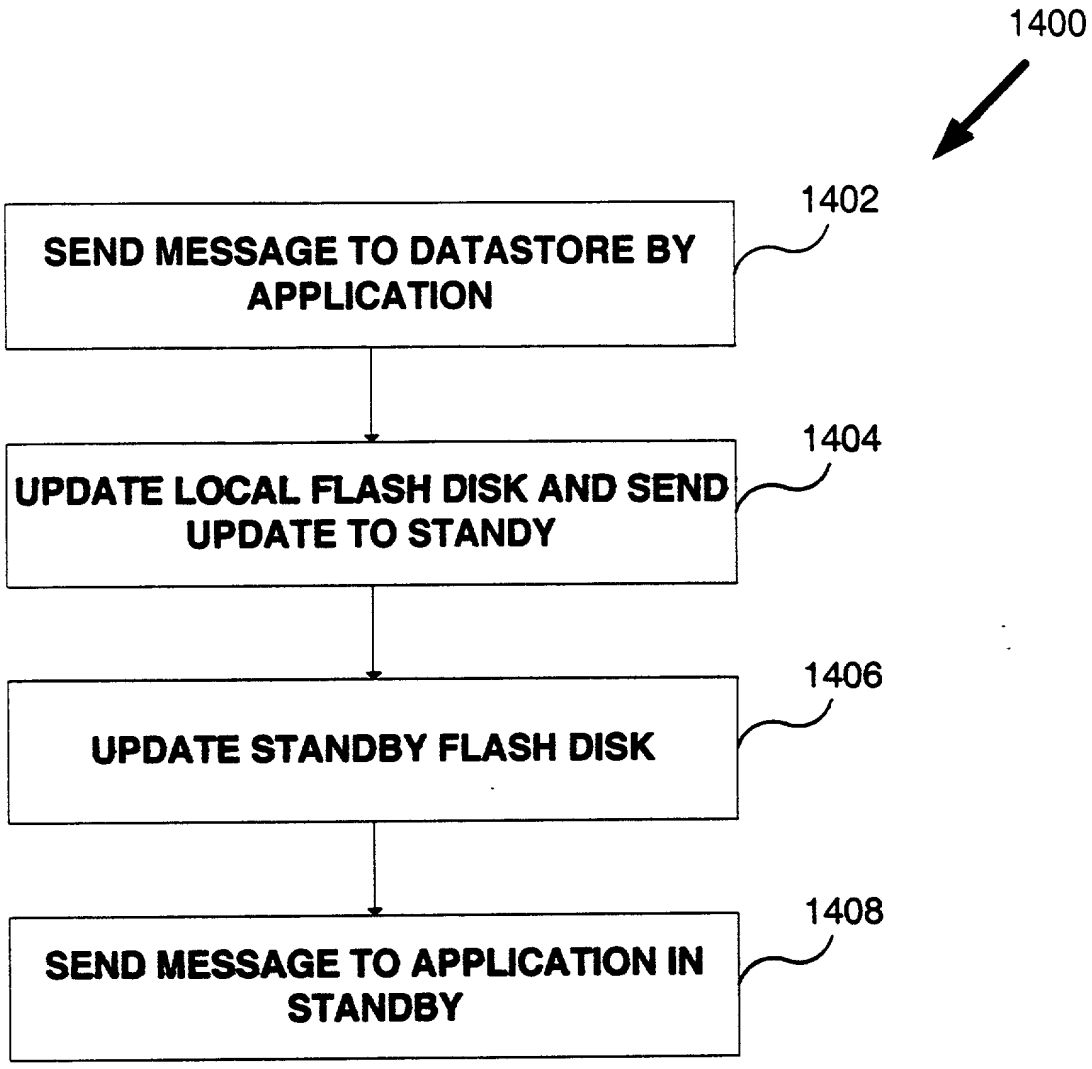
1400
1402
SEND MESSAGE TO DATASTORE BY APPLICATION
1404
UPDATE LOCAL FLASH DISK AND SEND UPDATE TO STANDY
1406
UPDATE STANDBY FLASH DISK
1408
SEND MESSAGE TO APPLICATION IN STANDBY

FIG. 14

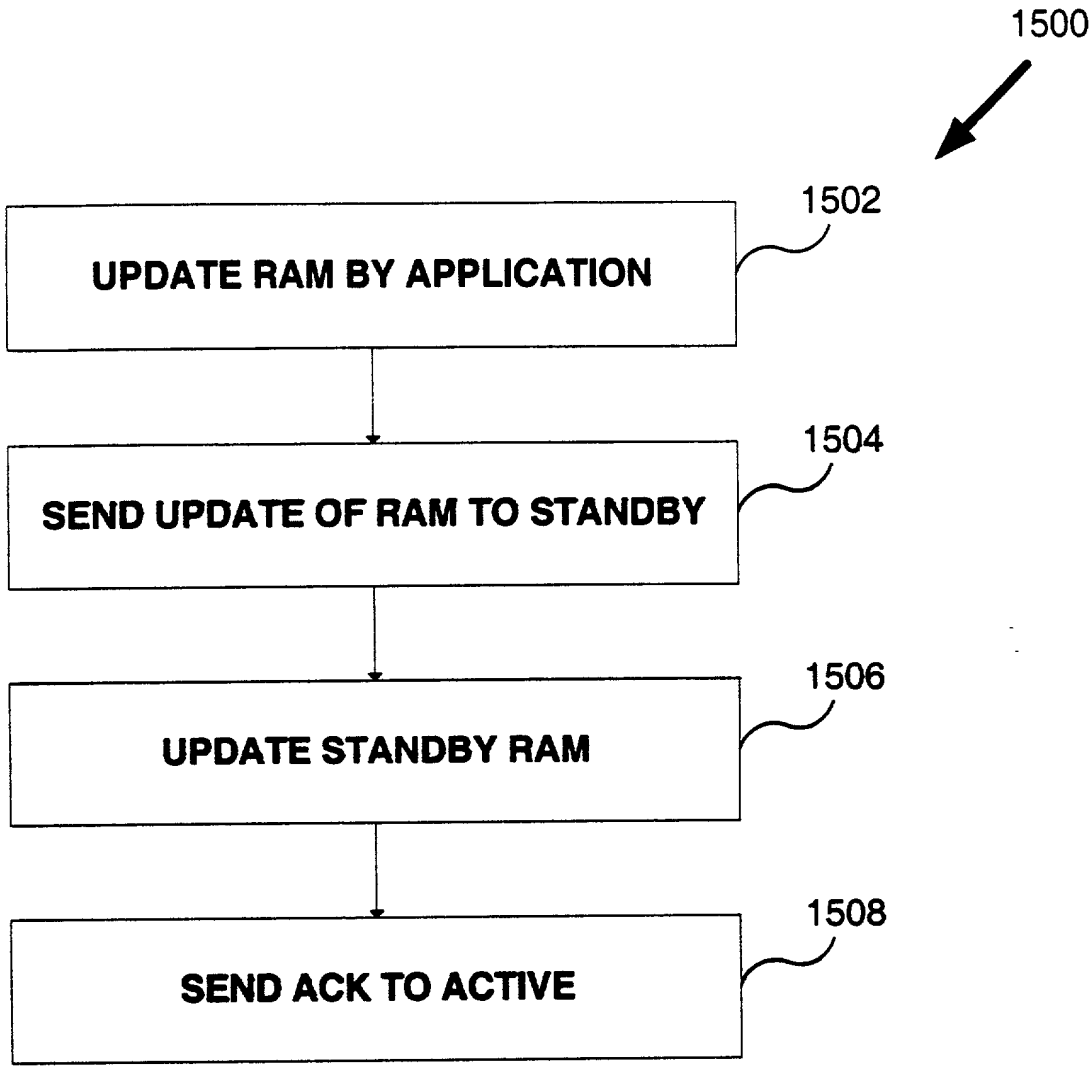
1500
1502
UPDATE RAM BY APPLICATION
1504
SEND UPDATE OF RAM TO STANDBY
1506
UPDATE STANDBY RAM
1508
SEND ACK TO ACTIVE

FIG. 15

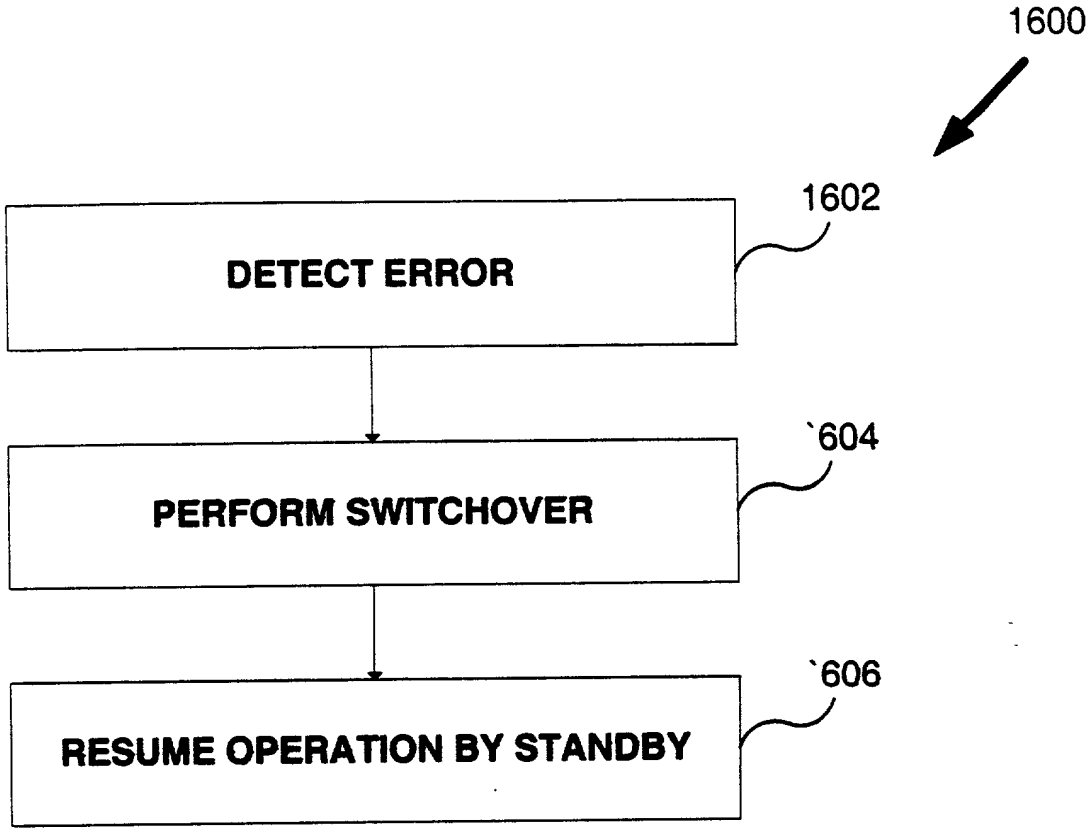
1600
1602
DETECT ERROR
`604
PERFORM SWITCHOVER
`606
RESUME OPERATION BY STANDBY

FIG. 16

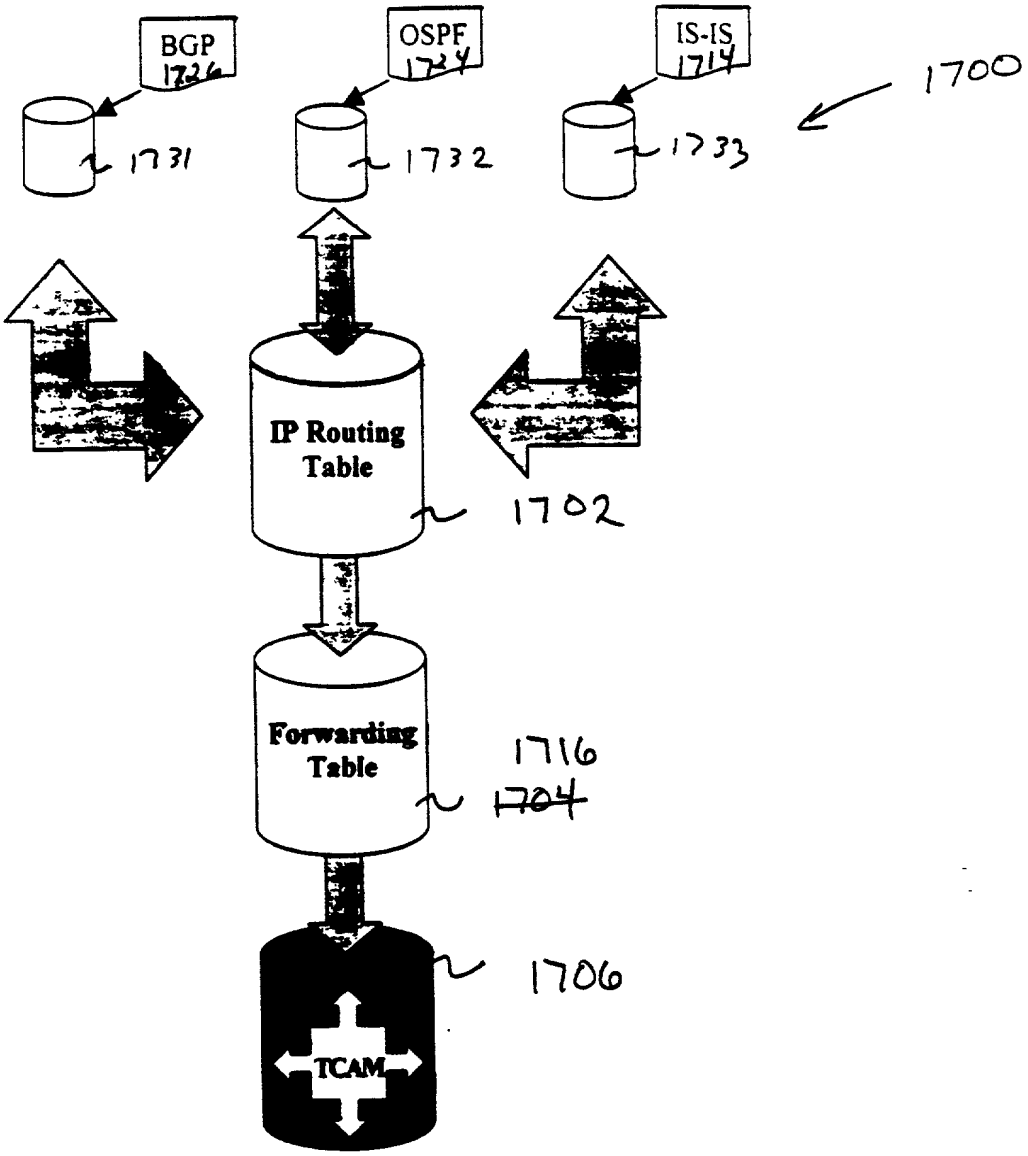
BGP
1726
OSPF
1724
IS-IS
1714
1700
1731
1732
1733
IP Routing Table
1702
Forwarding Table
1716
1704
1706
TCAM

FIG. 17

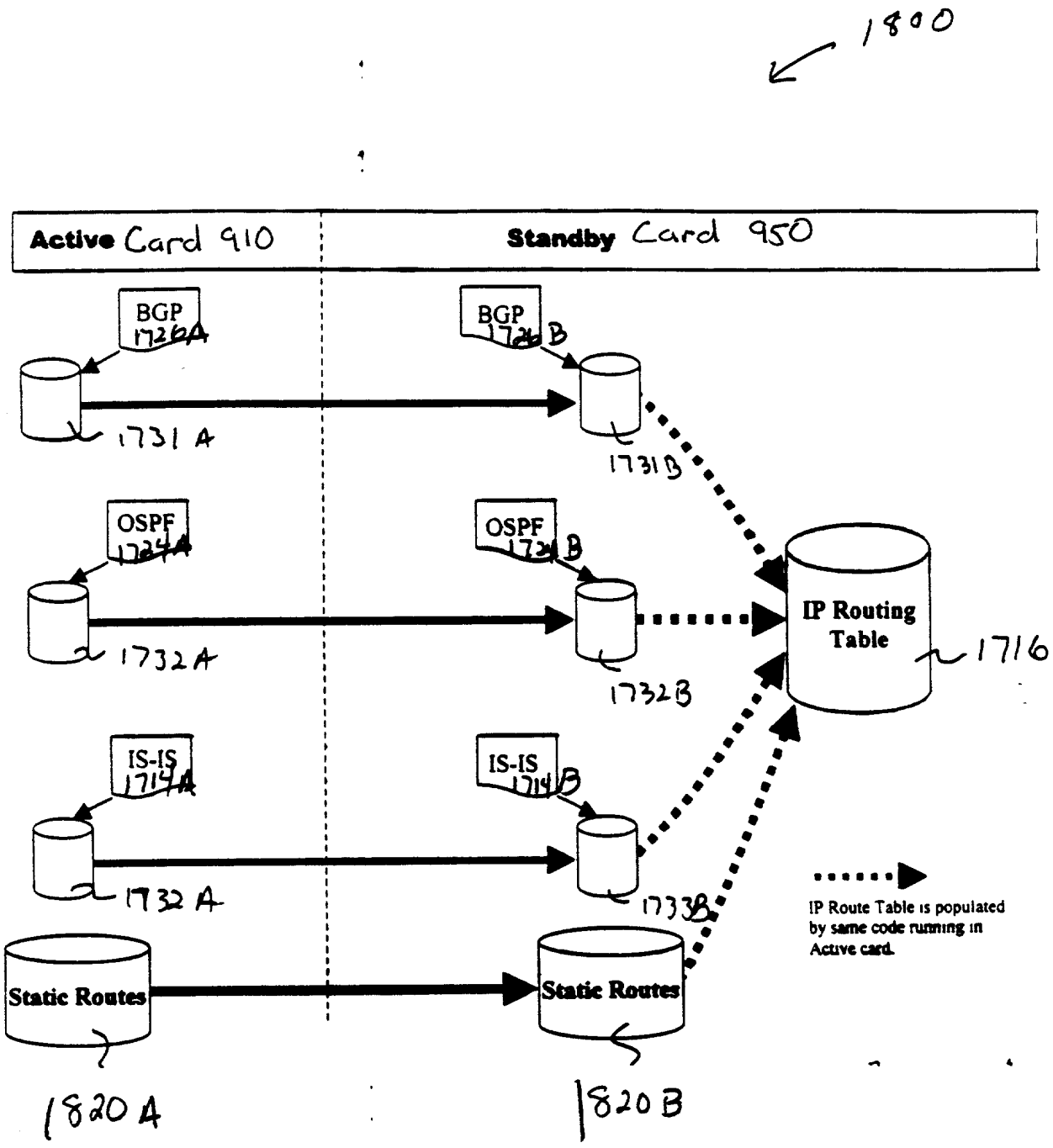
1800
Active Card 910
Standby Card 950
BGP
1726A
BGP
1726B
1731A
1731B
OSPF
1724A
OSPF
1724B
1732A
1732B
IP Routing Table
1716
IS-IS
1714A
IS-IS
1714B
1732A
1733B
IP Route Table is populated by same code running in Active card.
Static Routes
Static Routes
1820A
1820B

FIG. 18

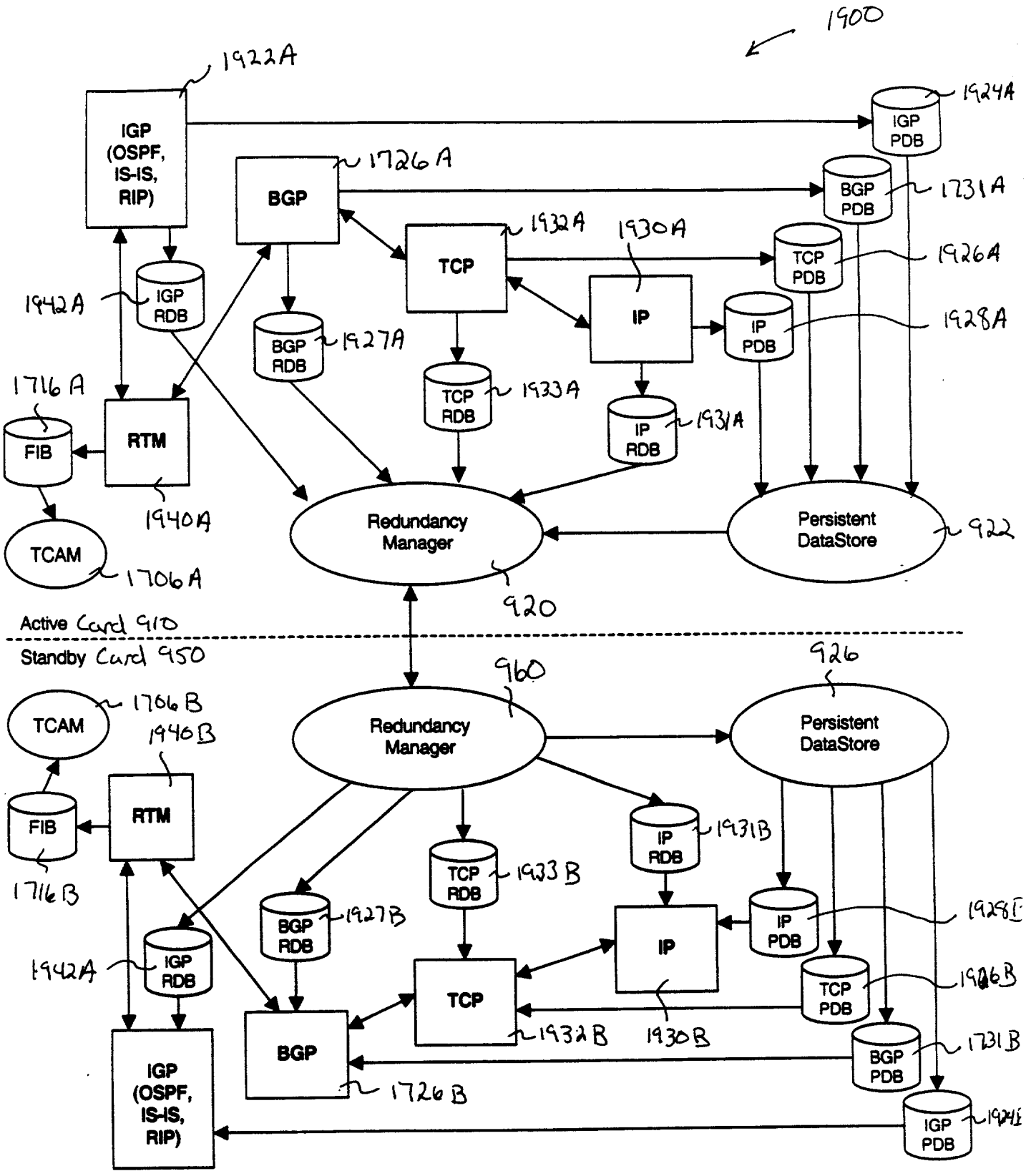
1900
1922A
IGP (OSPF, IS-IS, RIP)
1924A
IGP PDB
BGP
1726A
BGP PDB
1731A
TCP
1932A
1930A
TCP PDB
1926A
IP
IP PDB
1928A
1942A
IGP RDB
BGP RDB
1927A
TCP RDB
1933A
IP RDB
1931A
1716A
FIB
RTM
1940A
TCAM
1706A
Redundancy Manager
920
Persistent DataStore
922
Active Card 910
Standby Card 950
960
926
1706B
1940B
1716B
1927B
1933B
1931B
1928B
1942A
1926B
1932B
1930B
1731B
1726B
1924B

FIG. 19

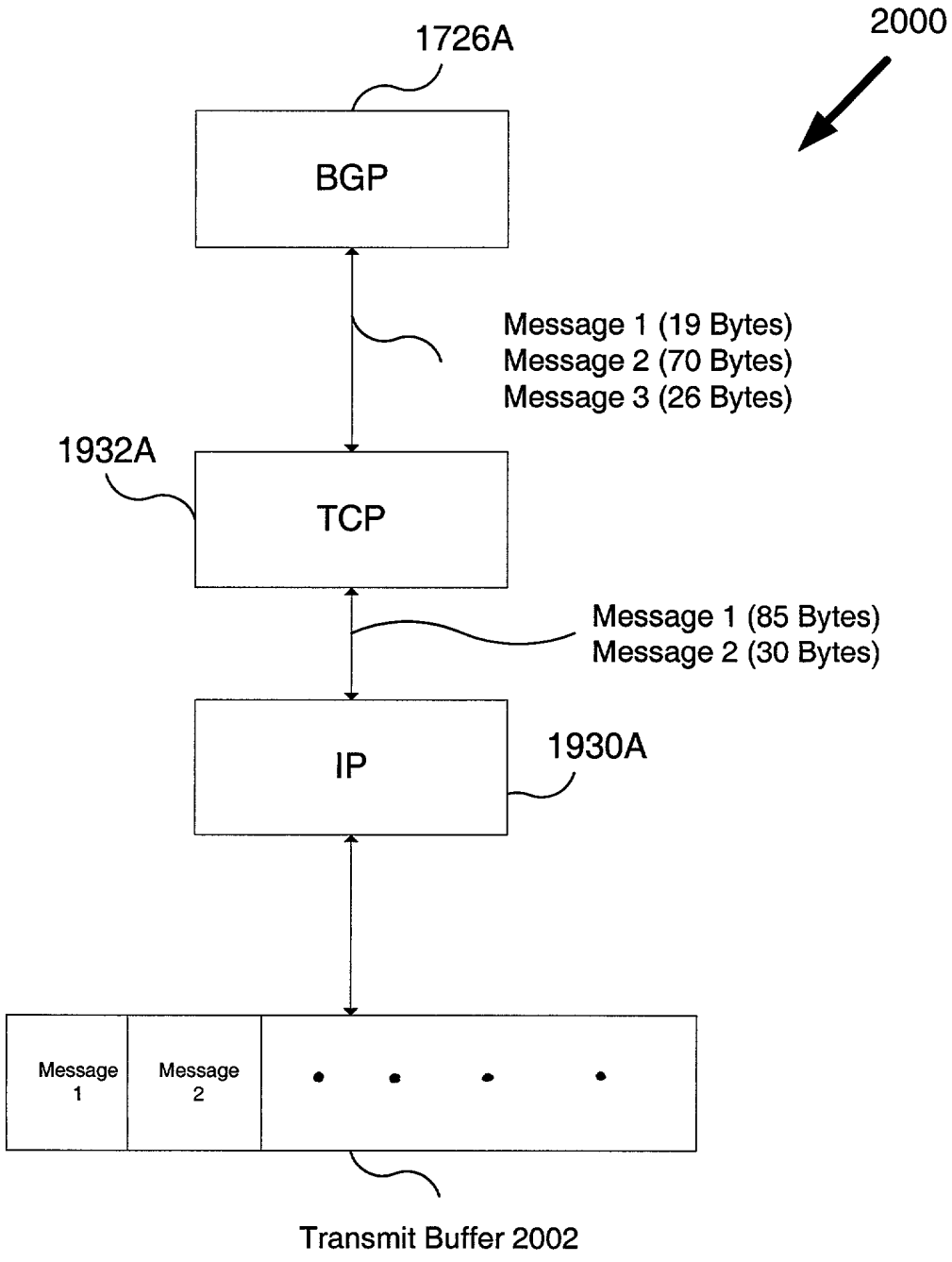
2000
1726A
BGP
Message 1 (19 Bytes)
Message 2 (70 Bytes)
Message 3 (26 Bytes)
1932A
TCP
Message 1 (85 Bytes)
Message 2 (30 Bytes)
IP
1930A
Message 1
Message 2
Transmit Buffer 2002

FIG. 20

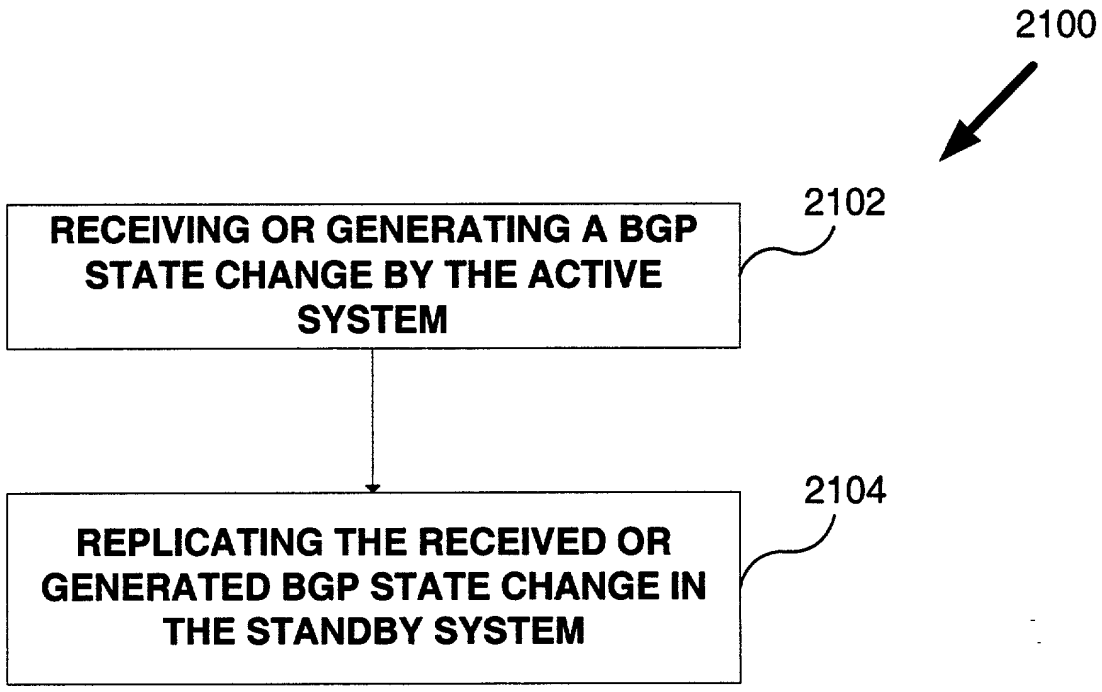
2100
2102
RECEIVING OR GENERATING A BGP STATE CHANGE BY THE ACTIVE SYSTEM
2104
REPLICATING THE RECEIVED OR GENERATED BGP STATE CHANGE IN THE STANDBY SYSTEM

FIG. 21A

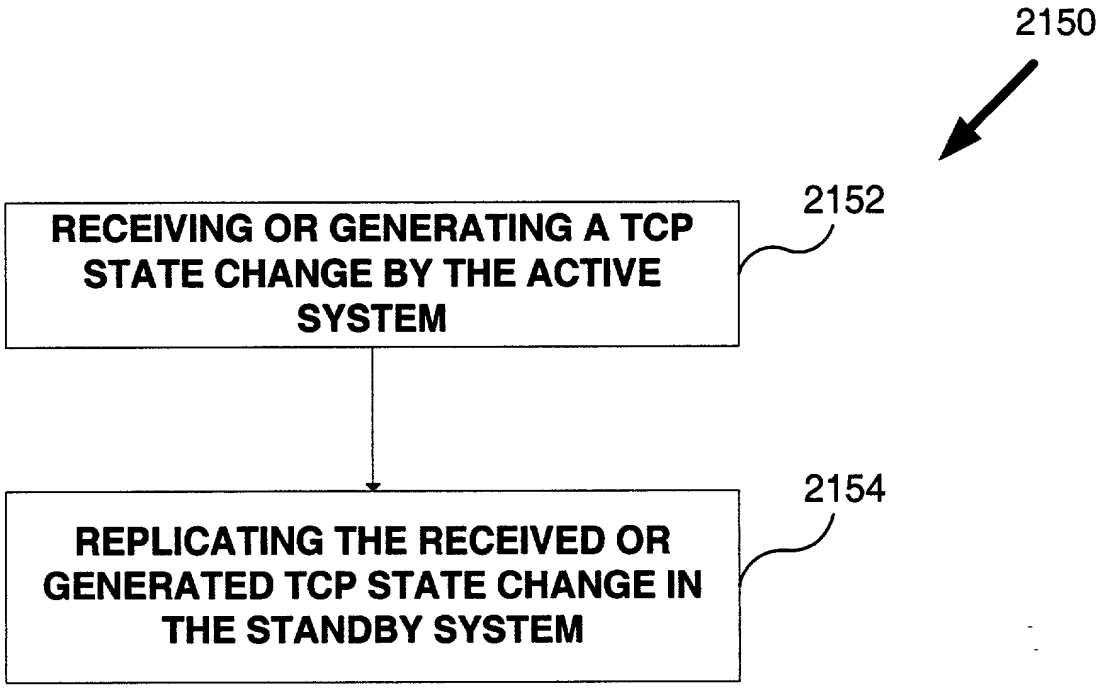
2150
2152
RECEIVING OR GENERATING A TCP STATE CHANGE BY THE ACTIVE SYSTEM
2154
REPLICATING THE RECEIVED OR GENERATED TCP STATE CHANGE IN THE STANDBY SYSTEM

FIG. 21B

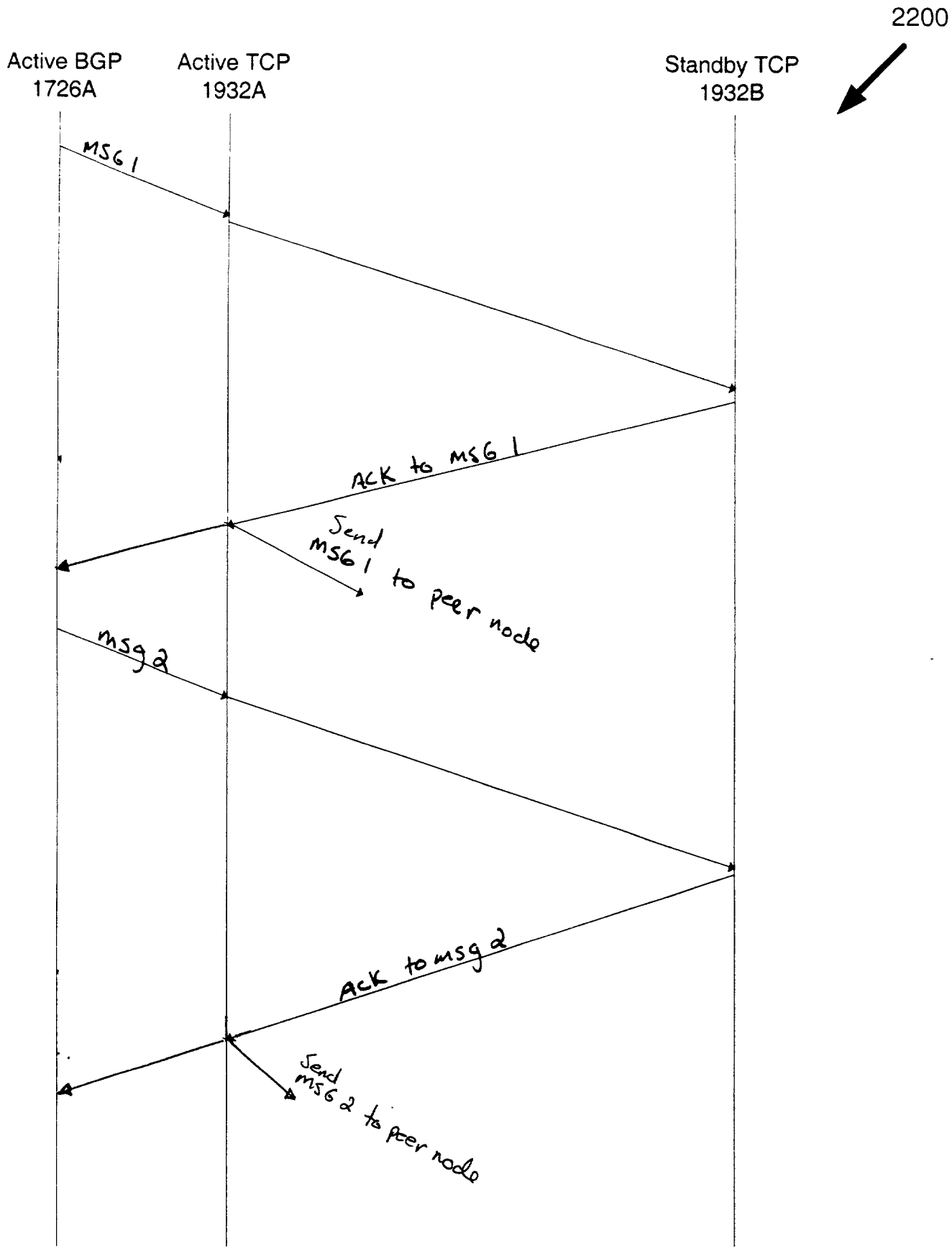
2200
Active BGP
1726A
Active TCP
1932A
Standby TCP
1932B
MSG 1
ACK to MSG 1
Send
MSG 1 to peer node
msg 2
ACK to msg 2
Send
MSG 2 to peer node

FIG. 22

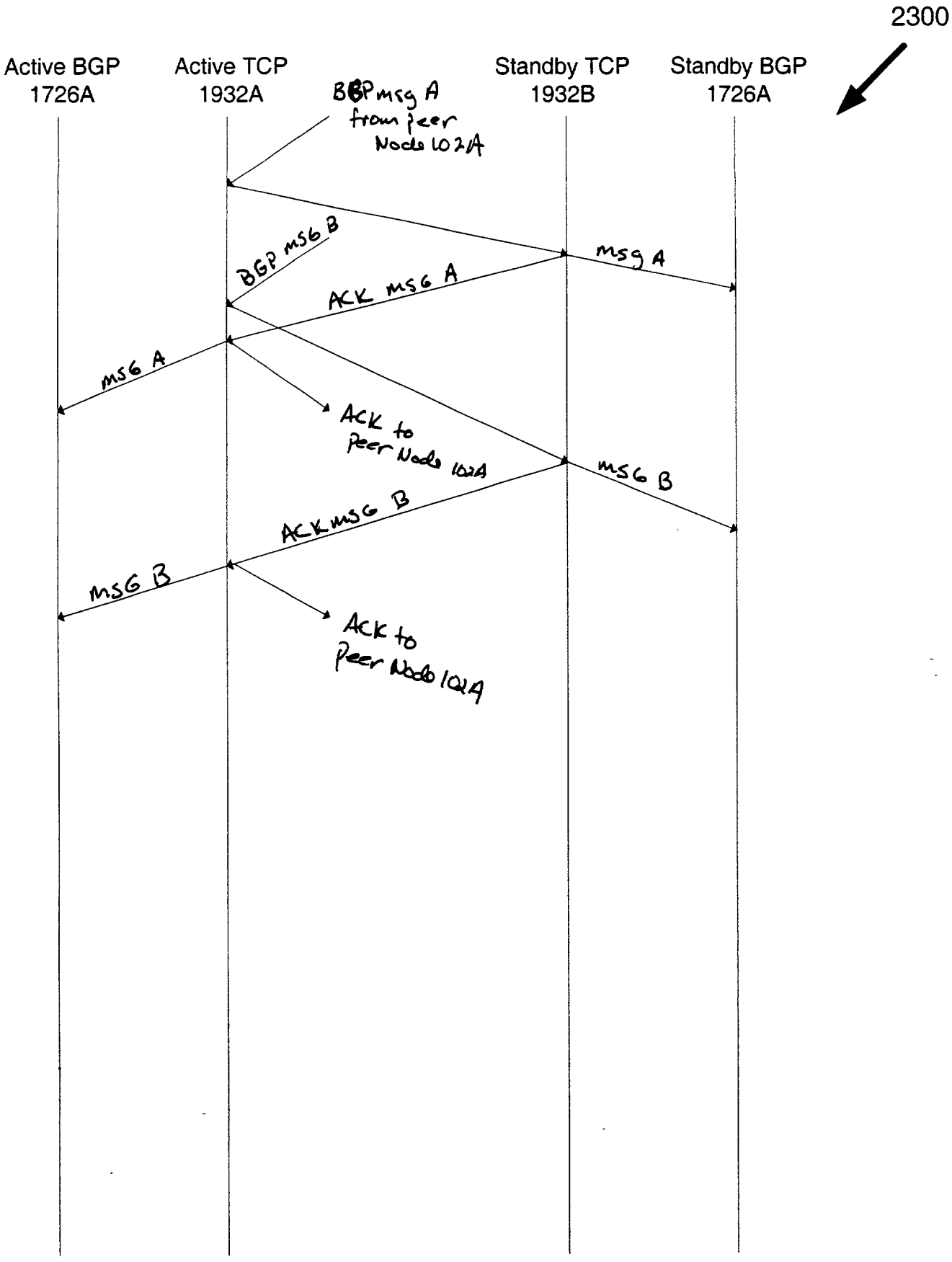
2300
Active BGP
1726A
Active TCP
1932A
Standby TCP
1932B
Standby BGP
1726A
BGP msg A
from peer
Node 102A
BGP MSG B
msg A
ACK MSG A
MSG A
ACK to
Peer Node 102A
MSG B
ACK MSG B
MSG B
ACK to
Peer Node 102A

FIG. 23

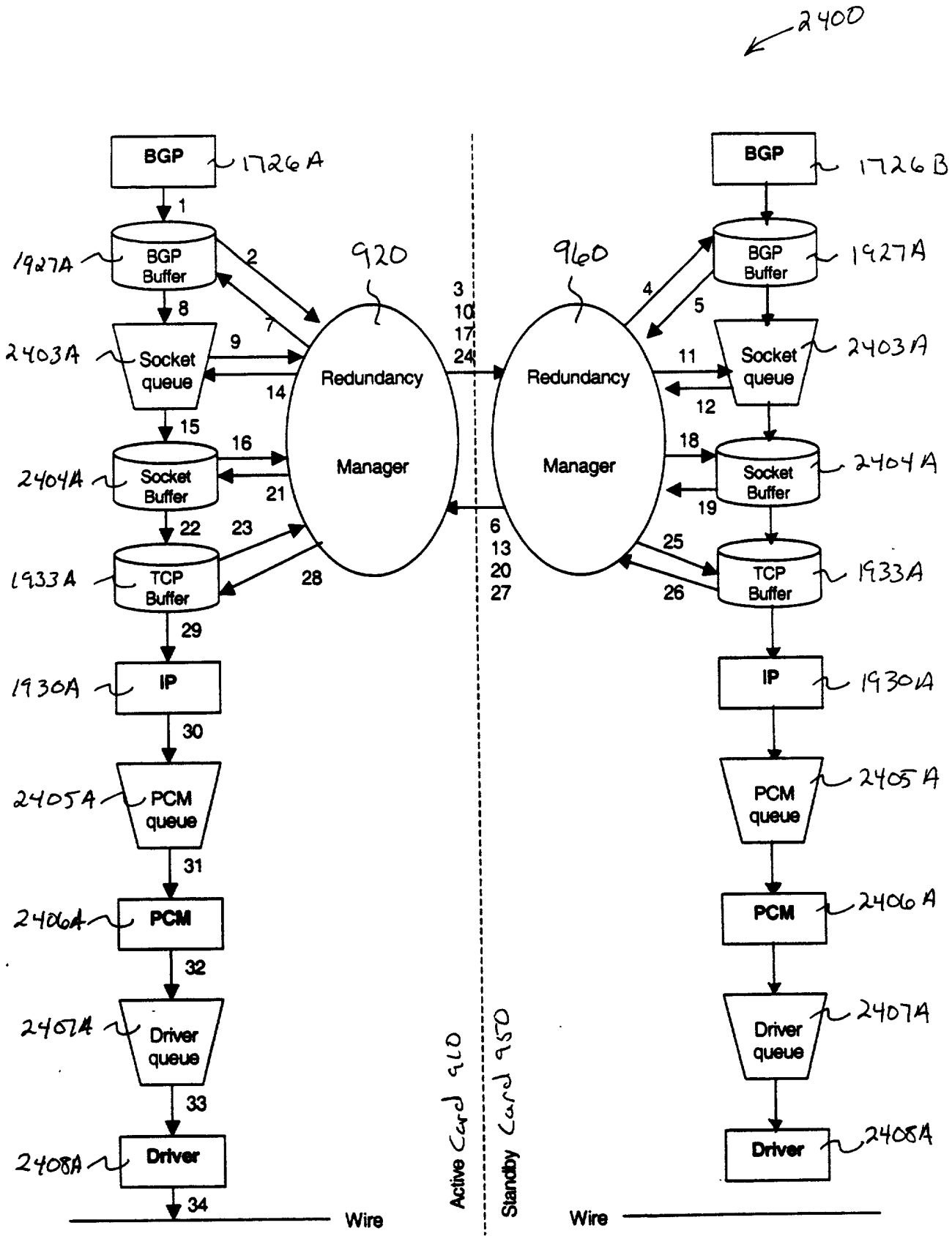
2400
BGP
1726A
1
1927A
BGP Buffer
2
920
8
2403A
Socket queue
9
7
Redundancy Manager
14
15
16
2404A
Socket Buffer
21
22
23
1933A
TCP Buffer
28
29
1930A
IP
30
2405A
PCM queue
31
2406A
PCM
32
2407A
Driver queue
33
2408A
Driver
34
Wire
3
10
17
24
6
13
20
27
Active Card 910
Standby Card 950
960
4
5
BGP
1726B
BGP Buffer
1927A
11
Socket queue
2403A
12
18
Socket Buffer
2404A
19
25
26
TCP Buffer
1933A
IP
1930A
PCM queue
2405A
PCM
2406A
Driver queue
2407A
Driver
2408A
Wire

FIG. 24

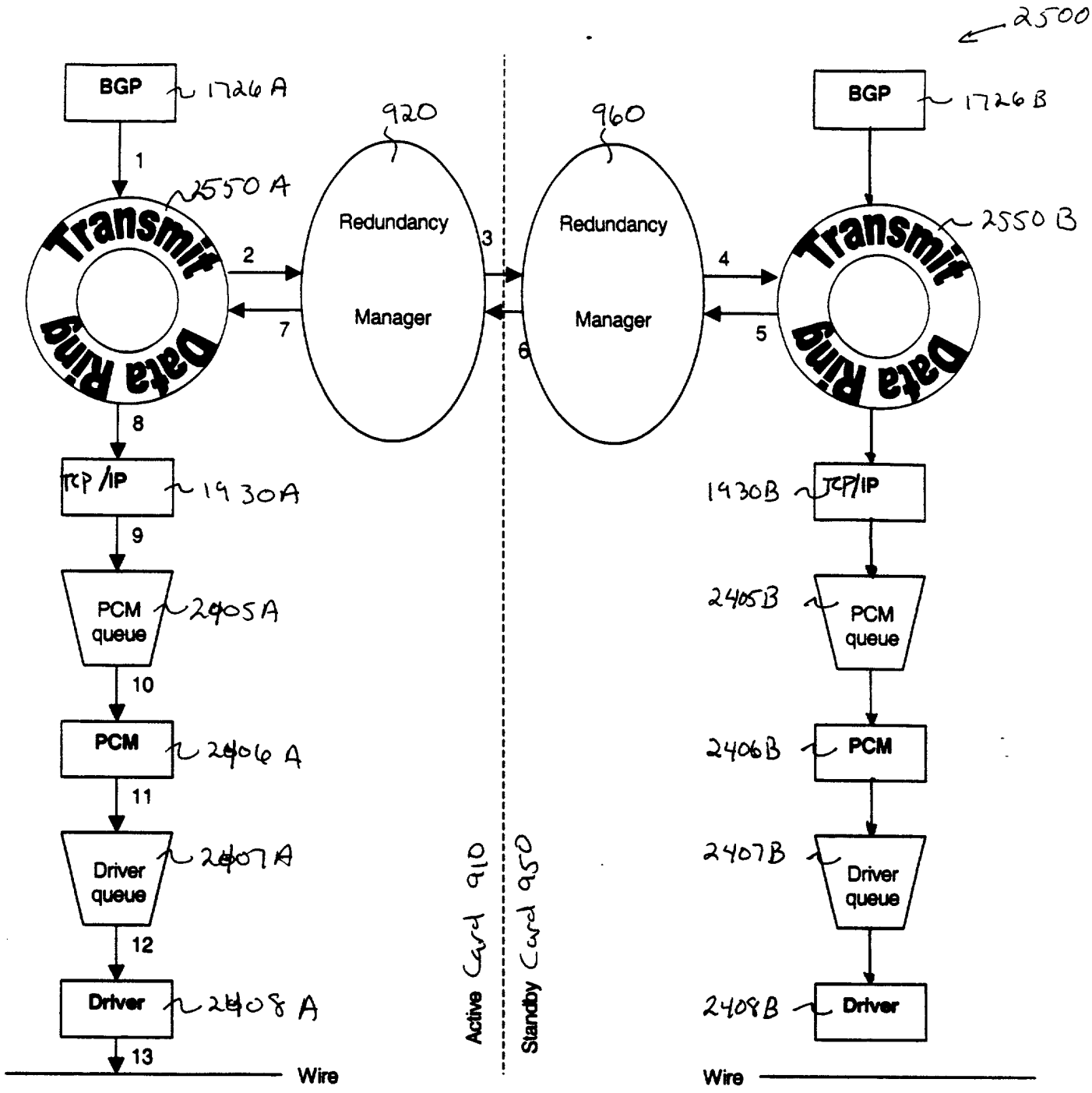
2500
BGP
1726A
1726B
920
960
1
2550A
2550B
Transmit Data Ring
Redundancy Manager
2
3
4
5
6
7
8
TCP/IP
1930A
1930B
9
PCM queue
2405A
2405B
10
PCM
2406A
2406B
11
Driver queue
2407A
2407B
12
Driver
2408A
2408B
13
Wire
Active Card 910
Standby Card 950

FIG. 25

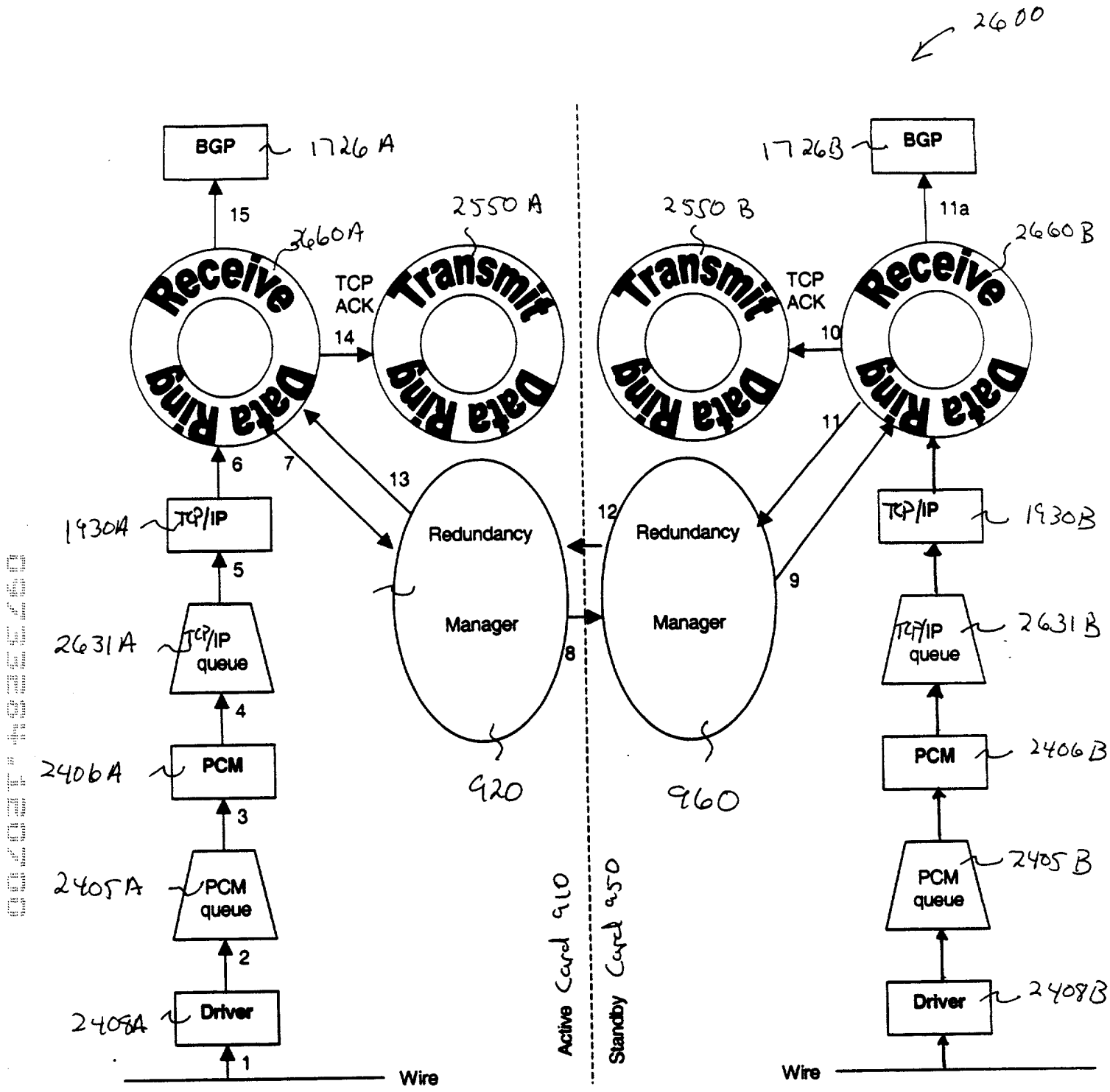
2600
BGP
1726A
1726B
BGP
15
11a
2660A
2550A
2550B
2660B
Receive Data Ring
Transmit Data Ring
Transmit Data Ring
Receive Data Ring
TCP ACK
14
TCP ACK
10
6
7
13
11
1930A
TCP/IP
Redundancy Manager
Redundancy Manager
12
TCP/IP
1930B
5
9
2631A
TCP/IP queue
TCP/IP queue
2631B
4
8
2406A
PCM
PCM
2406B
3
2405A
PCM queue
PCM queue
2405B
2
2408A
Driver
Driver
2408B
1
920
960
Wire
Wire
Active Card 910
Standby Card 950

FIG. 26

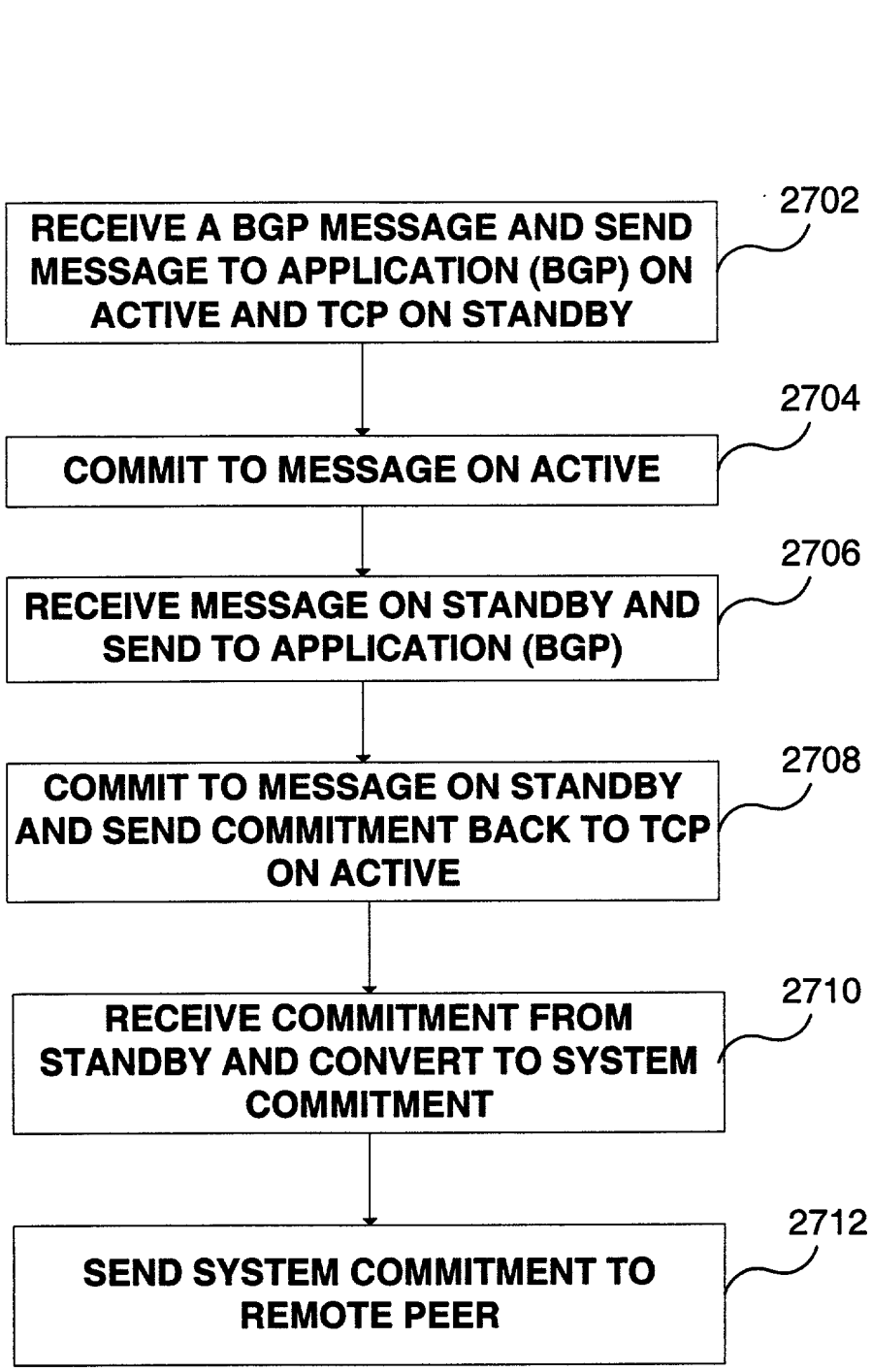
2700
RECEIVE A BGP MESSAGE AND SEND MESSAGE TO APPLICATION (BGP) ON ACTIVE AND TCP ON STANDBY
2702
COMMIT TO MESSAGE ON ACTIVE
2704
RECEIVE MESSAGE ON STANDBY AND SEND TO APPLICATION (BGP)
2706
COMMIT TO MESSAGE ON STANDBY AND SEND COMMITMENT BACK TO TCP ON ACTIVE
2708
RECEIVE COMMITMENT FROM STANDBY AND CONVERT TO SYSTEM COMMITMENT
2710
SEND SYSTEM COMMITMENT TO REMOTE PEER
2712

FIG. 27

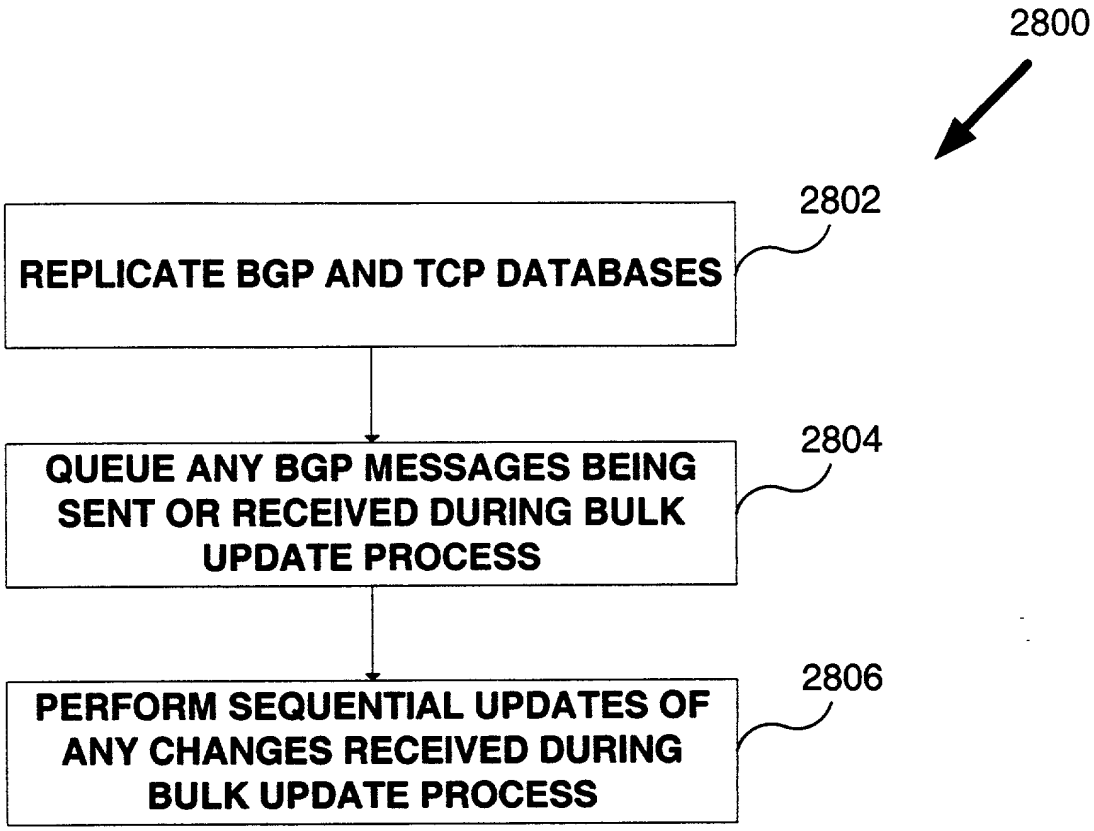
2800
2802
REPLICATE BGP AND TCP DATABASES
2804
QUEUE ANY BGP MESSAGES BEING SENT OR RECEIVED DURING BULK UPDATE PROCESS
2806
PERFORM SEQUENTIAL UPDATES OF ANY CHANGES RECEIVED DURING BULK UPDATE PROCESS

FIG. 28

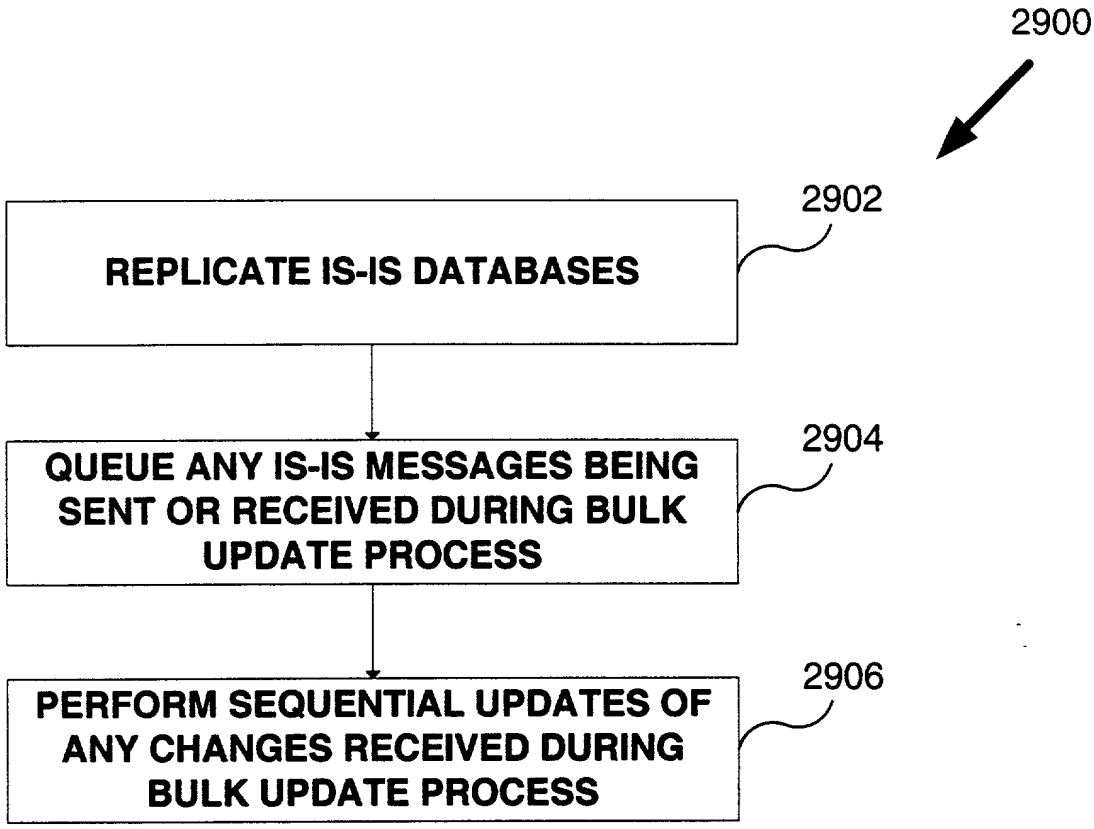
2900
2902
REPLICATE IS-IS DATABASES
2904
QUEUE ANY IS-IS MESSAGES BEING SENT OR RECEIVED DURING BULK UPDATE PROCESS
2906
PERFORM SEQUENTIAL UPDATES OF ANY CHANGES RECEIVED DURING BULK UPDATE PROCESS

FIG. 29

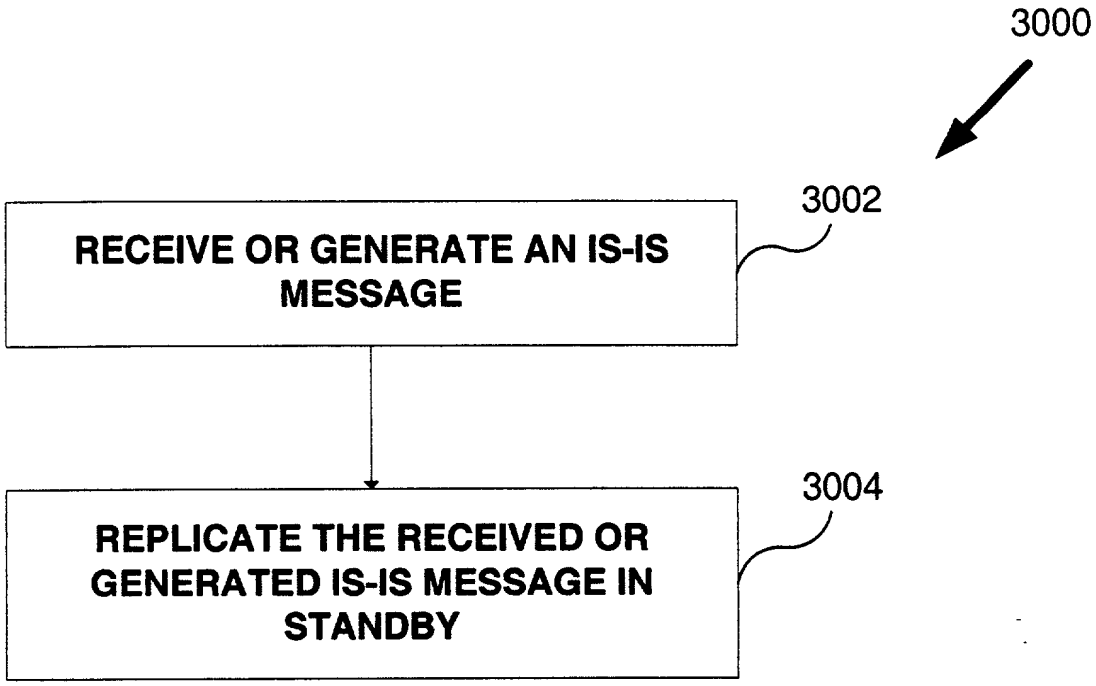
3000
3002
RECEIVE OR GENERATE AN IS-IS MESSAGE
3004
REPLICATE THE RECEIVED OR GENERATED IS-IS MESSAGE IN STANDBY

FIG. 30

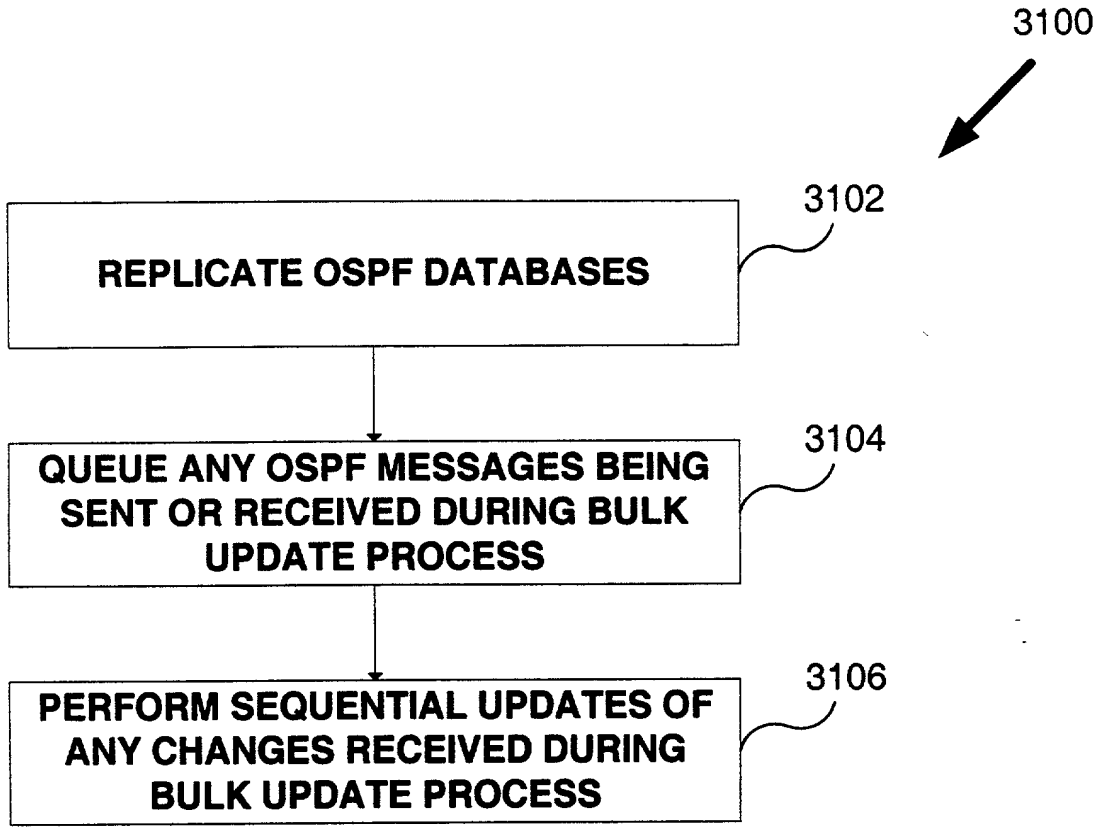
3100
3102
REPLICATE OSPF DATABASES
3104
QUEUE ANY OSPF MESSAGES BEING SENT OR RECEIVED DURING BULK UPDATE PROCESS
3106
PERFORM SEQUENTIAL UPDATES OF ANY CHANGES RECEIVED DURING BULK UPDATE PROCESS

FIG. 31

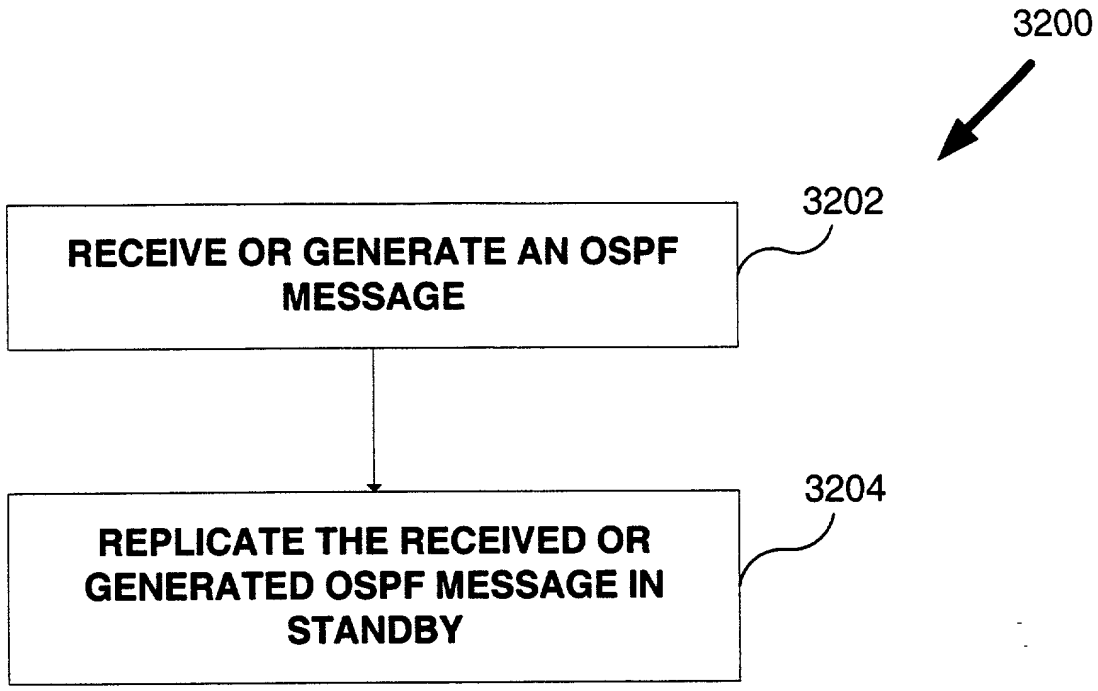
3200
3202
RECEIVE OR GENERATE AN OSPF MESSAGE
3204
REPLICATE THE RECEIVED OR GENERATED OSPF MESSAGE IN STANDBY

FIG. 32